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ABSTRACT

Discussed in this publication are infectious illnesses for which children attending day care appear to be at special risk. Also covered are the common cold, some infectious disease problems receiving media attention, and some other annoying but not serious diseases, such as head lice, pinworms, and contagious skin conditions. Causes, characteristics, symptoms, treatment, prophylaxis, and/or seriousness of diseases, as well as public attitudes toward them, are discussed. Focusing on respiratory diseases, chapter I describes acute upper respiratory illnesses (common cold), streptococcus sore throat, otitis media with effusion (OME), Hemophilus influenzae Type B disease (HiB), meningococcal meningitis, and tuberculosis. Chapter II concerns gastrointestinal infectious diseases, including hepatitis A, shigellosis, giardiasis, and rotavirus infection. Infections of the skin are described in chapter III. These include impetigo, fungus infections, ringworm of the scalp and body, scabies, and cold sores (herpes labialis). Other illnesses of special significance in day care are described in chapter IV: cytomegalovirus (CMV) infection, chicken pox, head lice, pinworms, and Acquired Immune Deficiency Syndrome (AIDS). Chapter V discusses immunization for diptheria/whooping cough/tetanus, the safety of immunization, and vaccination for measles (rubeola) and German measles (rubella). Chapter VI suggests guidelines for dealing with communicable diseases. (RH)

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Infectious Diseases in Day Care

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Esther K. Sleator, M.D.

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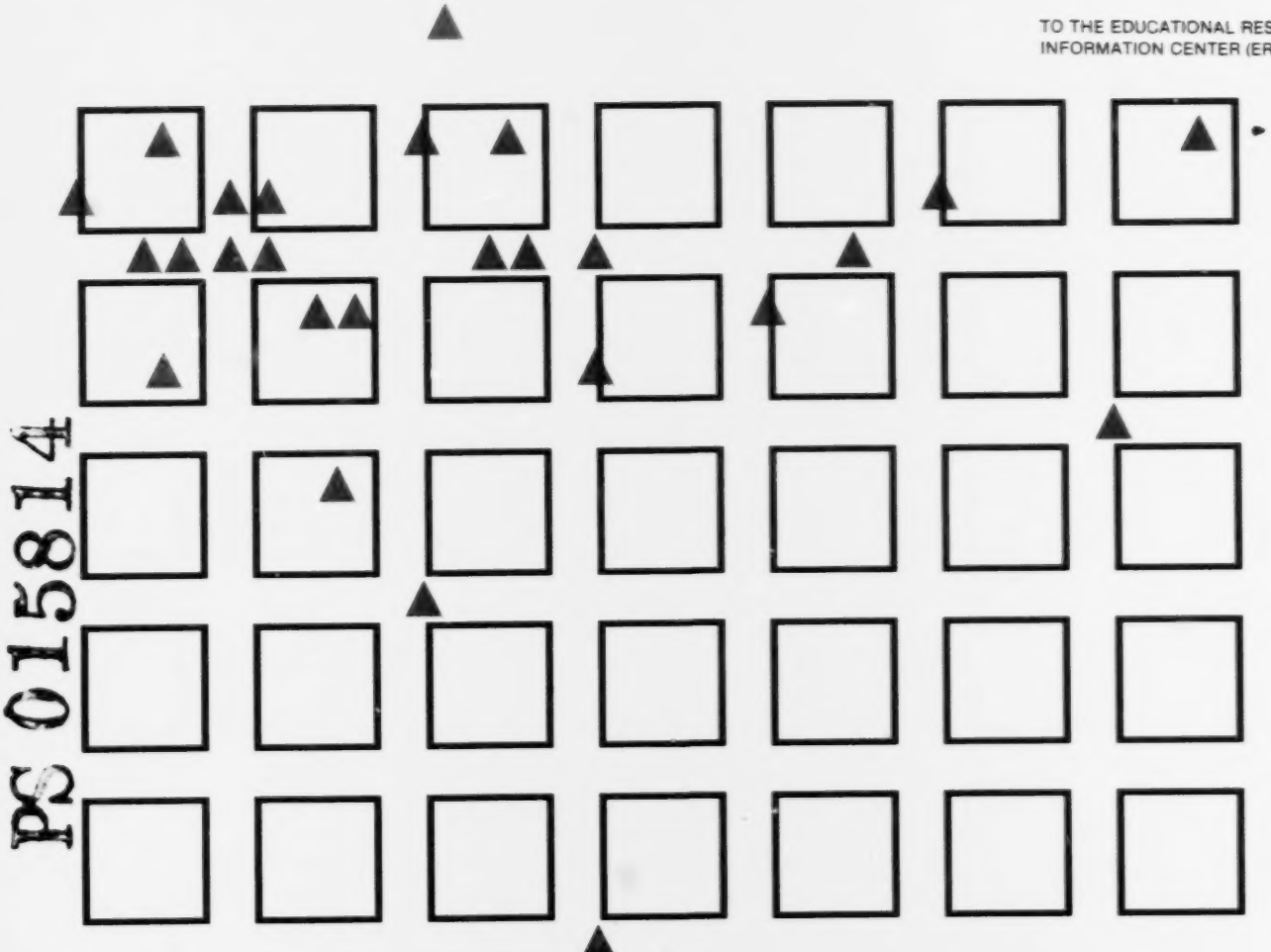

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INFECTIOUS DISEASES IN DAY CARE

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INTRODUCTION

Readers of the current popular press, whether it be the Wall Street Journal or newspaper Sunday supplements, are likely to gain the impression that those places in which children are gathered for care while their mothers work elsewhere are pesthouses responsible for the spread of loathsome diseases to the child attendees and the child's family members as well. Yet at the beginning of the 1970s, despite the fact that there were said to be 5,000,000 children in licensed day care centers (Marwick & Simmons, 1984) there was seemingly no interest in the topic of the spread of contagion in such centers and only one or two articles in the entire United States medical literature on the subject. At the present time, the number of pertinent medical articles must surely number in the hundreds (one review article alone cites 113) and the Index Medicus (a vast and rapidly growing compendium that lists all medical articles) now includes a section on child day care.

This late interest in the health aspects of out-of-home child care is surprising considering that day care is not of recent origin in this country. The first day care nursery opened in Boston in 1828. Why the heightened interest? One can safely assume that we are not seeing a new disease phenomenon. The appearance of a brand new disease is an exceedingly rare event, and it is safe to assume that known diseases have not proliferated as a result of poor hygienic conditions, which in fact have improved in the past 15 years.

The recognition and reporting of infectious disease outbreaks in centers may have been the stimulus for the relatively recent intense interest in infectious disease in child care centers. In fact, the growth of our knowledge is actually due mainly to the study and reporting of such disease outbreaks.

A startling publication by a group of members of various North Carolina health departments established this trend. In 1973, Gelbach and colleagues (Gelbach, MacCormack, Drake, & Thompson, 1973) published observations on a large number of cases of diarrheal disease in one day care center and of hepatitis A in another. In both cases, sanitary conditions were execrable and overcrowding was extreme. In one center, diapers were changed by workers who then prepared food without washing their hands, and soiled diapers and food were stored in the same closet. In the other, 110 children were enrolled in a frame house with three small rooms in which were kept as many as 60 children each shift. More than half the floor space contained cribs, cots, and highchairs, and as many as four infants occupied the same crib at the same time. There was one washstand and one toilet in the facility.

From that time to the present, reports of similar events involving a variety of communicable diseases have appeared one after another, although not usually in facilities in which conditions were so poor. The increase in information has been extensive, and to some, alarming. It is therefore of importance for the reader to understand thoroughly the peculiar limitations of medical knowledge in this field and to realize how what is known has been colored by the methods by which that knowledge has been accumulated.

As Susan Aronson (1983) puts it,

> Recent research findings focus on outbreaks, not on the usual state of health among day care users [emphasis added]. This crisis-oriented focus tends to distort everyone's perceptions of infectious disease risk. Although studies of outbreaks are helpful in devising control measures, they do not reflect the constant condition in all day care. (p. 10)

In an excellent recent summary of infectious disease in day care written by a group of leaders in the field (Goodman, Osterholm, Granoff, & Pickering, 1984), this point is reiterated. These observers add that

> only a limited number of studies have used a prospective approach to assess the occurrence of certain infections over time. More important, few published studies have concurrently compared the risk of infections among children attending and those not attending day care facilities. Thus, for most diseases, it remains speculative whether the relative risk of acquiring a specific infectious agent in day care programs is increased compared with the risk in non-day care settings. (pp. 134-135)

The purpose of making available to nonmedical readers a publication describing in some detail the nature and severity of the many communicable diseases to which children who attend out-of-home care facilities have been known to be exposed and sometimes afflicted is definitely not to frighten caregivers into conformity. A fearful attitude toward the situation under discussion is not justified. This information is rather presented on the assumption (and with the hope) that knowledge will result in calm, measured, appropriate reactions to situations that may arise in

such centers. If precautions are needed, surely they will be taken more consistently if such behavior is based on genuine knowledge than if it is based on the rote following of instructions.

Which Diseases Will Be Discussed?

Not quite all of the infectious diseases to which children are susceptible. A recent textbook entitled Infections in Children (Wedgwood, Davis, Ray, & Kelley, 1982) has 1,620 large-size pages--and the authors of that book no doubt grappled with the difficult job of intelligently limiting the material. Needless to say, the big problem in undertaking the present endeavor was deciding what to leave out, while at the same time being sure to provide, in a comprehensible manner, the medical information that would be most useful to people who care for young children outside the child's home.

The obvious choice was to include all infectious illnesses for which day care children appear to be at special risk as a result of being day care attendees. These illnesses will be covered. We do not really know whether children are at an increased risk for colds because of day care attendance, but the magnitude, the ubiquity, and the ever-present nuisance of colds is such that they seemed to call for discussion. Infectious disease problems that have had a good deal of media coverage are touched upon, as it is important for day care workers to be well enough informed on those topics to discuss them with parents. The quantity of medical publications on a disease also has been an influence on selection. The presence of attention by the medical community indicates an advancing field where progress is being made and, in most cases, also means the condition is important in day care (and often in the community as a whole). Finally, there are a few old-fashioned, everyday diseases that are almost

never discussed in current medical literature; these are not serious but are annoying and often disturbing to caregivers and children. Just a few of these will be covered: head lice, pinworms, and contagious skin conditions.

The perceptive reader will no doubt find in the following material diseases that don't fit in any of the above categories. These will go in the "it just seemed as if they ought to be included" category. And all who are actively involved in day care will inevitably find many conditions missing that they feel should have been covered. These readers are advised to turn to Wedgwood et al. (1982) and their 1,620 pages.

Some Important Generalizations about Infectious Disease in Day Care

Despite the fact that it has been well over 10 years since the contagious disease hazards in day care have begun to be documented, it was not until early in 1986 that the Centers for Disease Control (CDC) distributed for use by day care center directors and their staffs a training kit aimed at providing skills and knowledge to prevent unnecessary disease transmission (Centers for Disease Control, 1984). This training kit includes the first set of guidelines from the CDC directed toward the nonmedical people who have the responsibility for caring for groups of young children outside the home. (Instructions for obtaining the kit are included in section VI, on guidelines.) Considering that the CDC have published extensively on day care outbreaks in the journal Morbidity and Mortality Weekly Reports and have a strong tradition of providing recommendations aimed at the control of communicable disease, this delay in providing guidelines for day care staff and directors (many of whom have keenly, and articulately, felt the need for authoritative guidelines) is surprising.

A likely explanation for the deliberation in publishing guidelines is that it has proven to be a difficult task to devise recommendations that are not unnecessarily restrictive and are based on sound scientific evidence. In other words, it was necessary to come to grips with the question of what must be done to protect children in day care but keep day care a useful haven for children while their parents work. In addition, it is clearly important not to burden the day care staff with redundant cleanliness maintenence chores and so distract them from their very important nurturing and guidance activities. Should these chores become excessive, additional staffing is likely to become mandatory. Such increases may create an important financial burden for poor parents.

A recently published discussion on contagion in day care centers has highlighted some of the difficulties in establishing appropriate guidelines. As Glode has put it, "Recommendations must be based on sound scientific data but the available data are inadequate" (Glode, Hadler, Osterholm, & Pickering, 1986, p. 11). In the same publication, Hadler, instrumental as a CDC physician in devising the rules, recognizing that some health-related regulations are work-intensive, has noted that

> monetary considerations are also important in determining staff-to-children ratios, and this ratio varies widely throughout the country. In Massachusetts, the staffing ratio is one to every four toddlers. In Texas and Arizona, this ratio is one to every eight or ten. One person can barely maintain order among ten toddlers, let alone quality care. Yet the minute a state tries to change staff ratios, there's a strong parent lobby that says, "We can't afford it." If we're going to have day care centers

that provide satisfactory educational and social experience and minimize the transmission of infectious diseases, day care will have to be subsidized. (p. 11)

This halcyon possibility seems remote indeed in today's deficit-ridden climate. The difficulties that have plagued physicians in developing guidelines are amply demonstrated by the confusion that reigns in guideline development from one state to another. In 1982, the guidelines of 28 states indicated that children with any communicable disease should be sent home, 16 states left exclusion decisions up to the management, and 6 states had no regulations about ill children in day care centers (Shapiro, 1984).

The facts are:

1. Much of what is known about the spread of infectious diseases makes prevention of spread difficult.
2. Research information testing the effects of different procedures is at yet insufficient to provide the basis for scientifically sound guidelines.
3. Because many mothers must work, very young children are cared for in child care facilities. A much greater risk of outbreaks of communicable diseases exists in facilities that admit children under 2 years of age (Marwick & Simmons, 1984). There appears to be no way to avoid this problem.
4. Stringent guidelines, the simplest and most tempting to devise (as shown by the fact that, as already described, the majority of state guidelines have a total-exclusion rule) are recognized by thoughtful investigators to have the potential for causing unnecessary hardships to many. Indeed, strict guidelines may not

achieve the goal of a pure, unsullied-by-disease day care environment but may effect quite the opposite.

It is important to understand these difficulties. First, why is the prevention of spread of illness so difficult? To the naive, it might seem self-evident that children who are coughing, sneezing, and have mucous running out of their noses should be sent home forthwith. Should they? Only if they are so uncomfortable that they would be more comfortable and happier at home in bed. The facts are that these children have been spreading their infection for hours to days before there was any evidence that they were infected. This situation obtains for a great many communicable diseases. By the time one knows children have an infectious disease, they have very likely spread it far and wide.

Even more confusing is the fact that many children may be infected and capable of spreading an illness without ever manifesting the illness in a clearly discernable way. The asymptomatic, or "subclinical," case can demonstrably spread an illness without ever showing identifiable symptoms. One example (but by no means the only one) is hepatitis A. Young children with hepatitis, who can be shown to be infected by laboratory tests and by culturing the live virus from their stools, often, in fact usually, have no signs of illness. Yet those children can bring home hepatitis A to parents and older siblings, who usually develop the classical signs of the illness--fever, abdominal pain, and jaundice.

The lack of sound research demonstrating optimum methods for decreasing spread of disease is the next problem. Although it has now become popular for responsible state agencies writing guidelines to include daily washing and sanitizing of all day care equipment, no one has yet demonstrated that this distinctly nontrivial task has had a salubrious

effect. Such cleansing may very well turn out to be a good thing to do. Black and colleagues (1981) have conducted one small, controlled study that seems to show convincingly that prescribed handwashing at specific times on the part of staff and children does decrease the incidence of diarrhea. In addition, organisms and fecal material have been found on day care surfaces, or "fomites," and common sense seems to dictate that frequent, careful cleaning of such surfaces would minimize the spread of infection. However, washing and sanitizing may be a waste of time. Glode, a pediatric infectious disease specialist, feels that fomites play a relatively insignificant role in the transmission of disease (Glode et al., 1986). (Surely, little time elapses between the beginning of the school day and the possible contamination of some desirable toy.)

Next, the younger age groups now being admitted because of economic necessity on the part of both mothers and day care operators pose special problems because, as will be shown later, children in the first years of life are peculiarly susceptible to respiratory illnesses. The most important aspect of this problem, however, is that children of this age are not bowel trained; this situation greatly increases the risk of the occurrence of certain illnesses spread by the fecal-oral route. That is, feces in such centers seem almost invariably to become widespread in the environment and are subsequently unknowingly ingested (by adults as well as children), creating an ever-present threat of the spread of certain illnesses such as diarrheal diseases and hepatitis A.

Trying to solve all the above-mentioned problems by the use of stringent guidelines that would send home any child with evidence of infection is not a popular approach among some thoughtful leaders in the field. In fact, Joel Kuritsky, M.D., of the Minnesota Department of

Health, stated in a symposium workshop on exclusion and admission policies that there are no real reasons known for exclusion of any child from day care facilities (Kuritsky, 1984).

We should realize that, because by the time the illness is manifest the child has already spread the infection, the achievements of exclusion are negligible for many illnesses. It is also clear that frequent exclusion from school may pose an intolerable hardship on the mother whose job may be put at risk by frequent absences to care for an excluded child. The mother whose child experiences frequent forced absences from center or home day care may place her child in another facility with less stringent rules. The end result of the exclusion from the point of view of the community as a whole thus might be spread rather than confinement of the illness.

Aside from the fact that many consider them without a rational basis, are demanding guidelines likely to be followed in the usual busy day care center or child care home? Shapiro (1984) attempted to document the rigor with which centers follow guidelines. This investigator found that Connecticut requires the exclusion of all ill children, and the rules state that any child showing suspicious signs of communicable disease should be returned home or placed in the isolation area and the parent or guardian called immediately. A questionnaire survey showed that the exclusion rule was only partially followed. An average of 75% of those with sore throats and 30% of those with earaches and runny noses were sent home. These symptoms are undoubtedly the result of communicable diseases.

However, questionnaires are certainly not the best way of getting at actual practices, and we know little about how carefully a day care facility will follow demanding guidelines--or any guidelines, for that matter. It would be interesting to know, for example (and we do not),

just how many centers follow the guidelines of daily washing or sanitizing of equipment and toys in states where such cleansing is mandated.

Diseases Caused by Bacteria Versus Viruses

One last bit of basic information is particularly useful in the understanding of communicable diseases. This concerns the very important clinical distinction between diseases caused by bacteria and those caused by viruses. Bacteria are rather agreeable tiny creatures, visible under an ordinary light microscope, that will grow on a great variety of laboratory media readily available in any clinical lab. Of very great importance is the fact that they are, for the most part, acutely sensitive to antibiotics and other forms of chemotherapy. This sensitivity means that a quick and effective therapy for most bacterial illnesses is usually available.

Viruses, alas, are quite another story. They are visible only under complex and specialized electron microscopes, available only in research facilities, and they will grow only in living cells. In fact, a virus multiplies in the animal body by invading a cell, taking over the metabolism of the cell, and turning it into a factory that produces more viruses like itself, which in turn invade other cells. Viruses can be grown in the laboratory, but only in a special medium made up of living cells. These cultures are, for the most part, used only in research laboratories. And, in addition to being more difficult than bacterial illnesses to diagnose by laboratory methods, viral illnesses are not susceptible to antibiotics. Recently, a few chemicals have been developed that are effective in a few diseases caused by viruses. There is intense research interest in developing more because of the urgency of the problem; however, a quick and easy treatment for every virus illness is not going to happen overnight.

Acute Upper Respiratory Illnesses (Common Cold)

There are no other illnesses that even approach the frequency with which children are afflicted with colds (which unfortunately are caused by viruses), and this statement holds true whether or not the child is in day care. No child caregiver needs to read the literature to discover that most children in their care seemingly spend the entire winter with sticky material exuding from the nose, runny eyes, a persistent cough, and, not infrequently, a general air of misery. It is a widespread conviction among parents that children in out-of-home care have considerably more colds than those who stay at home. What actual research exists indicates that there is some truth to this belief, but that the assumption is not wholly true. It also appears that some benefits may eventually accrue to day care children, with a lessening of the frequency of colds they experience during their later preschool years.

The most extensive and meticulous data on this topic come from the Frank Porter Graham Child Development Center at the University of North Carolina at Chapel Hill. A recent report from that center summarizes this organization's experience with respiratory illnesses over a period of 16 years (Denny, Collier, & Henderson, in press). Since the center is both staffed by pediatricians whose field of research interest is respiratory disease in day care and supported by a complete virology and bacteriology laboratory, these data are incomparable. In fact, it is almost possible

to say that, in a sense, the data are too good. As the investigators themselves are always careful to point out, the conditions in their center are so outstandingly good from the health point of view that comparisons with the usual day care center may not easily be made, and thus generalizability may be limited.

The other flaw in these data, again freely recognized in the organization's reports, is that the control group (essential for evaluating any interventions) comes from a study done in Cleveland in the 1960s and is not considered ideal. The justification for the use of such a control group, and a sound one in the opinion of the present author, is that the Cleveland Family Study (Dingle, Badger, & Jordan, 1964) is the only study comparable to the Chapel Hill study in that, in both cases, observations were made over a period of many years and daily recording of illnesses took place. In the Frank Porter Graham Center, the children were observed daily by medical professionals. In the Cleveland study, the family kept daily records but was visited by a health professional once a week. However, many investigators do not find such a control group satisfactory and, although respecting the work of the North Carolina group, do not feel we have satisfactory comparative data on the rate of respiratory infections in day care attendees and children who stay home.

Careful studies such as the one done in Cleveland, which followed the children over many years to record the number of illnesses and which did not rely simply on parental memory or visits to the doctor, show that infants have an average of seven or eight colds a year (is it any wonder the kids always have runny noses?) and that this number decreases with age (Dingle et al., 1964). To quote Denny and his colleagues from North Carolina (Denny et al., in press),

It is also clear that acute respiratory infections are universal, and the most frequent cause of illness among children in any form of care. The principal questions, which remain unanswered in great part, are whether day care in its various forms increases the incidence and severity of acute respiratory infections.

As good an answer to this question as any presently available (and none is ideal) is provided by the Chapel Hill group (which, by the way, excluded sick children from their center only if the child had chicken pox and for no other infectious illness). The children in their study ranged in age from birth to 5 years of age. The peak incidence of respiratory illness occurred from 6 months to 1 year--an average of 10.4 colds per year at this age. With passage of time, the incidence decreased; for the group as a whole, there was an average of 6.5 respiratory illnesses per year.

The findings of greatest interest resulted from a comparison of the Frank Porter Graham results with those of the Cleveland Family Study, in which children in home care were observed. The Cleveland group found the highest incidence of colds in the children with siblings in school and fewer colds in those without siblings in school. However, the incidence of colds remained roughly the same from 6 months until 5 years of age. The day care group at Chapel Hill had a higher incidence of colds than that of the Cleveland group until about age 2 1/2, when it dropped sharply. By 4 and 5 years of age, the incidence was significantly less than for the Cleveland children.

An extrapolation from the data suggests that the early exposures in day care may result in an increase in colds, but, as the duration of day

care experience increases, some resistance to colds develops. This certainly seems to be the case in children who begin day care in infancy. Whether or not the finding also holds true in children who begin day care later has not yet been demonstrated.

Despite the encouraging suggestion that some benefit is eventually derived by day care children in that the incidence of colds may decrease more rapidly than is the case for children in home care, individuals who provide day care might just as well become resigned to the ubiquity of colds. There is little or no preventive power in the exclusion of children with colds because of presymptomatic spread and because children can spread the virus without showing evidence of the illness. Can anything be done to decrease the incidence of colds? There are certainly no research data demonstrating effective methods. However, the Child Day Care Infectious Disease Study Group of the CDC (1984), has made some common-sense suggestions.

Although colds are usually spread by respiratory droplets most readily contacted in closed spaces, there is good evidence that certain cold-producing viruses can live on environmental surfaces and objects for several hours and can survive for up to 30 minutes on cloth or paper containing nasal secretions. It has actually been demonstrated that colds have been spread by hand contact (Hendley, Wenzel, & Gwaltney, 1973). Therefore, the CDC study group urges careful hand- washing, environmental cleanliness, rapid disposal of tissues with respiratory secretions on them, and handwashing after touching such secretions. (As will be subsequently discussed, these procedures are of proven value in the prevention of spread of gastrointestinal illnesses, and so it can be recommended that they become routine practice in every center).

However, the caregiver should have no illusion that any of the suggested interventions will make a lot of difference. Those intrepid individuals who make a career of caring for others' children will certainly be living with runny noses, watering eyes, and unpleasant coughs for much of the winter in temperate climates. This would be true as well if they were staying at home with their own few little ones. It is predictably a lot more true when they are spending their days with 5 to 50 of this very cold-susceptible age group.

Streptococcus Sore Throat

"Strep", or streptococcus, sore throat is widely recognized as an infection about which concern is justified. This is certainly a respiratory illness since the mode of spread is by droplets from the throat of one person to another. Certainly, the close contact that obtains in children's centers would simulate the family situation, in which spread of the infection from one family member to another is well-known. The incidence of strep throats in child centers has not been well-documented, but it is reasonable to assume that this illness can present a problem.

Fortunately, the streptococcus is a bacterium and, therefore, readily diagnosed with accuracy and highly treatable with the antibiotic penicillin. There are many types of the organism, but the only one that is feared and for which treatment is indicated is the group A beta hemolytic streptococcus. The special status of this variant is due to the fact that it is capable of causing complications, the most serious being rheumatic fever. Although rheumatic fever is very much on the wane, no doubt because of the availability of penicillin, when it occurs it can be a crippling disease. Therefore, vigorous treatment of streptococcus infections is uniformly recommended by authorities.

However, it must be kept in mind that very few sore throats are caused by group A beta hemolytic strep. The vast majority of such infections are caused by viruses. Antibiotic treatment is indicated only for group A beta hemolytic streptococcus sore throats and for no others. It can be stated categorically that it is impossible to identify infections caused by that organism either by the severity of the infection or by the appearance of the throat--not by day care personnel, not by nurses, and not by doctors, even the most experienced. The diagnosis can be made only by culture. A recent study (Poses, Cebul, Collins, & Fager, 1985) to determine the accuracy of experienced doctors in diagnosing strep throats by appearance showed that, as a group, the physicians overestimated the probability of a positive throat culture for 81% of their patients. These investigators showed also that, of all the sore throats cultured, only 4.9% were positive for group A beta hemolytic streptococcus. This number or an even lower percentage is the usual number of positive cultures found. A child with a proven group A beta hemolytic strep throat can be readmitted 24 hours after appropriate treatment is begun. The wise policy is to request that the parents have their child's throat cultured if the child has a sore throat. If the culture is negative for strep, exclusion is not indicated.

What is the harm of treating any old sore throat with penicillin just to play it safe? Plenty. For one thing, the patient can possibly be put at risk because of a reaction to the unnecessary drug. In addition, the overuse of antibiotics is causing the development of resistant strains of bacteria to the extent that many physicians fear we may overdrug ourselves back to the dreadful pre-antibiotic era. The individual does not become resistant to the antibiotic, but the bacteria do.

Insist on throat cultures. It is the responsible thing to do.

Otitis Media with Effusion (OME)

The middle ear is the space between the eardrum (the tympanum) and the sensory receptors that send sounds to the brain. The sound waves are transmitted from the eardrum to the sensory receptors by three tiny, connected bones located in the cavity of the middle ear. Children are peculiarly susceptible to infected middle ears, or otitis media with effusion (OME). According to Dr. G. Scott Giebink, a pediatric infectious disease specialist at the University of Minnesota, 16% of all children's visits to doctors are due to OME (Giebink, 1984). The only more common reasons for visits to the doctor are well-baby care and immunization. The peak incidence of OME is between 6 and 24 months of age.

OME can be caused by a variety of organisms, but if the child is under 4 years of age physicians have been advised always to treat with an antibiotic to which the Hemophilus influenzae (an infamous germ of which there will be much more later), is susceptible, as this is often the infectious agent in the young age group.

According to Dr. Giebink, there is a connection between the presence of virus in the respiratory tract and OME. Therefore, the peak incidence of OME occurs at the same age as the peak incidence of upper respiratory infections or colds. Dr. Giebink's hypothesis to explain this connection is that the virus involvement results in blocking of the eustachian tube (a tube connecting the middle ear with the back of the throat that must be patent for proper functioning of the middle ear). The presence of virus has been shown to block the eustachian tube with mucous, and the end result is an infection of the middle ear.

The combination of a blocked eustachian tube and infectious bacteria will result in the collection of fluid in the middle ear: It may be pus,

which will result in an acute OME, or a clear, so-called serous fluid, which can result in a chronic OME.

New instruments have greatly increased the ease with which the presence of fluid in the middle ear can be determined. "Tympanometry" can be accomplished in the doctor's office by use of a hand-held instrument. This device makes possible a quick screening that is often more reliable in determining the presence of fluid in the middle ear than peering into the child's ear through an otoscope.

This anatomy lesson is, unfortunately, important for any level of understanding of these very important infections in children. Middle ear infections are important because many investigators (although not all) feel one of the risk factors for the development of OME is attendance in out-of-home care. For example, Vinther, Pederson, and Elbrond (1984), in a study done in Denmark, found that 40.3% of those in day care had a history of OME, whereas the same was true of only 31.9% of those in home care. They found also that a significantly larger proportion of children who had started day care before the age of 6 months had a history of OME. These differences held true for both acute and chronic OME.

Another reason for this emphasis on increased incidence of fluid in the middle ear is that such fluid accumulations may, and often do, decrease hearing sensitivity. When this occurs for a prolonged period at the age of maximum language development, there is clearly good reason for concern. It is well-known that fluid often persists for weeks or even months after all acute signs of infection in the ear have gone (Klein, 1985). Whether or not, and how often, language development is impeded by mild alterations in hearing sensitivity has not been solidly established. Many studies suggest that language problems occur, but these studies are

not considered by most scholars to be very reliable. After all, the natural language development of one child differs from that of another depending on innate ability and environmental factors. Therefore, comparing the language development of children with episodes of fluid in their middle ears with that of children who have not had such fluid accumulation is enormously difficult.

There is certainly nothing the caregiver can do to prevent the occurrence of OME except to practice sensible hygienic measures, as previously suggested for colds. Whether these measures have much effect is unknown. However, since day care is widely accepted as one of the risk factors making children susceptible to OME, those involved in out-of-home care of children should certainly be familiar with and on the lookout for evidence of middle ear infections.

Hemophilus Influenzae Type B Disease (HiB)

We all know that influenza, or "flu," is an epidemic disease occurring primarily in winter that has its most serious effects mainly in old people and the chronically ill and that is difficult to distinguish from a cold. This type of influenza is not the same as Hemophilus influenzae type B disease, or HiB, as it is called. Whereas influenza is a virus, HiB is a bacterial infection that may result in some very severe, even killing, diseases.

Not many members of the lay community are familiar with HiB; in fact, even some members of the medical community (for example, the majority of nonpediatric nurses and doctors who work in adult medicine) may not be informed. Day care providers need to understand this infection because there is now some evidence that day care children are at a somewhat higher risk for acquiring HiB disease than are those who stay at home. In

addition, as there are some special procedures that may be indicated in exposed or even nonexposed day care children, day care providers should have sufficient information to intelligently discuss the condition with parents.

Before providing more details, it needs to be made clear that the majority of centers will probably never experience a case of serious HiB disease, and an even smaller number are likely to have what could be called an "outbreak" (i.e., as many as two cases within a period of 6 months). Reviewing 16 years of operation of the Frank Porter Graham Center, Denny et al. (in press) reported not a single case of HiB disease, even though no sick child was ever excluded except for chicken pox. Ward, Gorman, Phillips, and Fraser (1978) have described a day care outbreak in which three children were infected. They point out that this number was 100 times the expected annual total, based on HiB national age-specific incidence. In the 18 months during which this episode occurred, there had been a total of 10 affected children in all of Lawrence, Kansas. The point is that day care providers certainly need not live in fear of this condition. Nevertheless, it is far from a trivial threat because of the desperate seriousness of the illnesses when they do occur.

Most of the Hemophilus organisms cultured from man (the only species in which the organism grows naturally) do not consist of cells covered with capsules and are, as a result, nontypable. However, there are six types that do have capsules; they produce distinct antibodies and can, therefore, be "typed" or classified. All the "invasive" (i.e., transmitted to remote organs through the bloodstream) diseases caused by Hemophilus are caused by the type B strain.

First among these diseases is spinal meningitis, a dreaded infection of the coverings of the central nervous system, including the spinal cord. In fact, HiB causes an estimated 10,000 to 15,000 cases of meningitis in the United States each year and 60 to 70% of all spinal meningitis in the pediatric population (Ginsburg, McCracken, Rae, & Parke, 1977). Despite availability of effective antibiotics, 5% to 10% die of the meningitis, and as many as 15% of those who survive are left with neurological problems of various sorts (Granoff & Cates, 1985). HiB also can cause epiglottis, a swelling of one of the structures in the throat that may become severe enough to block breathing and cause death. It can cause septic (bacterial) arthritis, an infection involving pus in the joints, and it can cause cellulitis, a diffuse inflammation of the tissue right under the skin, commonly occurring on the face and neck. An estimated 6,000 cases of these three diseases are the result of HiB.

In addition to these invasive diseases, the nontypable strains of Hemophilus can cause a gamut of generally less severe illnesses by contiguous spread: infections of the middle ear, pneunomia, sinusitis, and bronchitis. The nontypable strains are frequent inhabitants of the throats of well children. (This is also true of type B at times.)

The germs first inhabit the nose and throat (hence classification of HiB as a respiratory disease). If the disease spreads to others, it spreads from there by droplet dispersal. The number of children without symptoms and who will not come down with HiB disease from whose throats HiB bacteria can be cultured may be very high during an outbreak in a center (Granoff, Gilsdorf, Gessert, & Basden, 1979). In one center studied, there were two cases of invasive disease within a 60-day period, but 49% of nonaffected children were shown to be carrying the bacteria in

their throats. In the two control centers where there was no overt HiB disease, there were, respectively, 1% and 4% HiB in asymptomatic children.

HiB is most common in children under 2 years of age (the highest rate occurs at 6 to 7 months) and appears most frequently in males, poor families, Blacks, Apache and Navaho Indians, and Alaskan Eskimos. Children who share a closed space, whether at home or in a center, are at special risk for HiB infection because, as noted earlier, the organism is spread from one person to another through infected droplets from the nose and throat.

Many children in day care centers are both in the age group highly susceptible to HiB disease and exposed to many other children. According to the CDC's Child Day Care Infectious Disease Study Group (1984), some evidence is now accumulating that children in centers may be at somewhat greater risk of acquiring HiB than those in home care. The group reports that several studies document an increased risk of secondary cases in household contacts, but it is still not absolutely certain that there is increased risk of secondary infection for children in the day care setting.

Clearly, there are a great many uncertainties about the dangers of HiB disease, both in the home and in centers. However, as reports of outbreaks began to appear in the literature, a literature about preventive measures also began to develop. A diligent search was undertaken for the best answers to the questions of whether or not preventively given antibiotics would hold off subsequent cases of invasive diseases in nonaffected children and, if so, which antibiotics would be most effective (American Academy of Pediatrics, 1982; Band, Fraser, & Ajello, 1984; Gessert, Granoff, & Gilsdorf, 1980; Granoff & Daum, 1980; Granoff et al., 1979; Murphy, McCracken, Moor, Gulig, & Hanson, 1983; Prober, Ipp, & Bannatyne, 1982; Yogev, Melick, & Kabat, 1981).

It soon became apparent that the common antibiotics were ineffective in eliminating the HiB organism from the nose and throats of nonsymptomatic carriers who had been exposed to an invasive case. However, 4 days of treatment of the contacts of active cases with once-a-day administration of the antibiotic Rifampin appears to be effective in eradicating the carrier state (Gessert et al., 1980; Granoff et al., 1979). Whether or not to administer this antibiotic to all the children in a center after the appearance of one invasive case or to wait until another case has occurred is now under discussion; in fact, there is a rather heated controversy on the matter. However, the individual physician--who will certainly be notified if one case of invasive HiB disease appears in a center--will have to make the decision for his or her patient (or the local health department may make recommendations if it becomes involved). Day care personnel have the responsibility for notifying the other parents when a proven case of HiB invasive disease appears in a center. It would also be wise for day care staff to notify the local health department. When two cases of HiB disease occur in a center within 60 days of each other, all children as well as the staff should get preventive therapy.

A new element in the picture has served both to spread the fame (and infame) of HiB disease and to arouse fear and even more confusion among parents. Very suddenly, public announcements have appeared in various media stating that there is a previously unheard-of disease, and parents had better get their kids immunized against it right away. Considering that practically no lay people have ever heard of the disease before and that the important concepts about the disease are not simple, very few have much understanding of what is going on.

True, there is now an effective vaccine against Hemophilis influenzae type B disease. This vaccine has been recently approved by the Food and Drug Administration and is available in most pediatricians' offices. The vaccine, unfortunately, has a serious flaw. It does not bring about reliable immunity before the age of 2. Considering that the ravages of the disease tend to occur during the first year of life, this is a serious flaw indeed. However, as approximately 35 to 40% of HiB disease occurs among children 18 months of age and older and 25% occurs above 24 months of age, there does seem to be an indication for the use of the vaccine. Because the vaccine causes little reaction and appears to bring about an excellent antibody response at the age of 2 and older--and some antibody response as early as 18 months of age--the Immunization Practices Advisory Committee of the CDC (1985) recommends immunization for the following groups:

1. All children 24 months of age and older. (How long the immunity will last--that is, if boosters will be needed--is not yet known.)
2. Children at 18 months of age, particularly those in known high-risk groups. These children may need a second dose of vaccine within 18 months of the initial dose. (Children in day care are considered to be in this high-risk group.)
3. Children over 2 who have not been immunized. Although the risk of the illness is greatly diminished, it is not nonexistent in this group. (The child's physician will be responsible for deciding whether or not to recommend immunization.)

Granoff and Cates (1985), respected investigators in the field of pediatric infectious disease, disagree with some of the recommendations of the CDC's advisory committee. They point out that there are no data on

the effectiveness of the vaccine at 18 months of age in children in the United States. (The age distribution of the disease is somewhat younger in Finland, where the major research on the vaccine has been carried out.) They also suggest that there is no evidence that a second dose later in life acts as a booster. In general, Granoff and Cates feel that, because there are inadequate data to substantiate the benefits of immunization in the age group 18 to 23 months, it seems preferable to wait until such children are 24 months old, when vaccine efficacy can be assured. They make a convincing case, but in this country the recommendations of the CDC are usually followed.

It should be kept in mind that this vaccine will not protect against localized conditions such as OME and sinusitis caused by nontypable Hemophilus infection since the vaccine is made from the capsule of Hemophilus type B bacteria. The nontypable forms do not have a capsule, and the antibodies caused by a capsular vaccine do not affect the nontypable bacteria. However, the search for a vaccine that will produce immunity in the age group at high risk is actively going forward.

Meningococcal Meningitis

The meningococcus is another bacterium that sometimes causes spinal meningitis, always a very serious condition. There are about 4,000 cases a year in the United States but, unlike HiB meningitis, meningococcal meningitis occurs in all age groups, with very young children being somewhat more susceptible. As household contacts have some small risk for also developing meningococcal meningitis, and day care companions are considered to have risks similar to those who share a home, preventive antibiotic therapy is recommended for nonaffected children in the center.

This type of meningitis is included in our discussion of respiratory disease, because, like HiB meningitis, it is spread from one person to others (sometimes by an asymptomatic carrier) by droplets of respiratory secretions. Parents should always, of course, be notified when there is a case of diagnosed bacterial meningitis in a center. Viral meningitis also occurs but is less serious and often gets better spontaneously. No treatment for contacts of viral meningitis is available even if it were indicated.

Tuberculosis

Tuberculosis, once a true scourge, has now faded into probably unjustified obscurity. In 1982, 25,520 new cases were reported in the United States, but of that number only 3.1% were children (Child Day Care Infectious Disease Study Group, 1984). Improved living conditions, as well as effective chemotherapy, seem to have been the decisive factors in making tuberculosis no longer a common, debilitating, and often deadly disease. However, as the incidence figures make clear, the disease is still in existence.

When tuberculosis infection was common, tuberculin skin testing was an important case-finding strategy. A positive test means the individual has been infected in the past or is infected currently and further workup is indicated. However, positive skin tests are now such a rarity that they have lost their value as a case-finding method, and although skin tests are still commonly performed in children of day care and school age, routine screening of day care children is not recommended by the Child Day Care Infectious Disease Study Group (1984). However, it is still true that an adult with tuberculosis is a hazard to the young children with whom he or she is in contact, and it is not rare to see reports of small outbreaks initiated by, for example, a schoolbus driver.

An episode that took place in the early 1970s gives a dramatic picture of why some precautionary measures are still needed (Kaupas, 1974). In 1969, a 55-year-old janitor was admitted to the state sanatorium because of far-advanced tuberculosis of the lungs. For many years, the patient's wife had been providing day care for about 25 children. Three months before the outbreak, the husband and wife applied for a license to operate their family day care home. Tuberculin testing or chest X-rays were not required by the licensing agency. Just before the janitor was admitted to the sanitorium, two symptomatic children from this day care home were admitted to a hospital, and physicians made a diagnosis of primary tuberculosis in both. Thirty-six children besides the two who had been diagnosed earlier were identified as having been recently cared for or were currently in care in the day care home. All were tuberculin tested and given chest X-rays. Eventually, a total of 11 cases of active tuberculosis were found among the 38 children, all acquired from one adult.

This episode strengthens the point made by the Child Day Care Infectious Disease Study Group (1984) that workers and volunteers involved with out-of-home care should be screened for tuberculosis with tuberculin tests, and those with a positive test should have chest X-rays and be further evaluated if indicated. These tests are usually available free of charge at the local public health department and should be required of all adults who will be working in day care.

GASTROINTESTINAL INFECTIOUS DISEASES

The most common type of gastrointestinal illness in children is diarrhea--that is, the passage of loose or watery stools, usually with increased frequency. Most cases of acute diarrhea are self-limiting and of short duration. Even on investigation, in most cases a specific infectious cause is not determined. In this discussion, only those forms of gastrointestinal illnesses known to be spread from one individual to another and to be of importance in the day care setting will be discussed.

The mode of spread of this group of diseases (mainly diarrheas caused by a variety of organisms and hepatitis A) is probably the most clearly defined of any of the infections prevalent in child care establishments. It is a mode that often comes as a surprise to nonmedical people and sometimes seems difficult for them to accept. The fact is that many infectious gastrointestinal diseases occurring both in day care and the home are spread by the ingestion of fecal material, usually in amounts not visible to the naked eye.

Ekanem and his associates (Ekanem, DuPont, Pickering, Selwyn, & Hawkins, 1983) have established that fecal material appears to be ubiquitous in centers in which non-toilet-trained children are in attendance. Fecal material is in evidence even during periods when there is no outbreak of gastrointestinal illness, and the amount of contamination greatly increases during an outbreak. The authors defined an outbreak as the occurrence of two or more cases of diarrhea in one room

within a 48-hour period. Diarrhea in this study was defined as the occurrence of unformed (loose and watery) bowel movements twice or more than the normal daily frequency for a particular child.

The investigators, using a long-established method of determining the presence of fecal material, cultured a great variety of surfaces in five day care centers. This sampling was done routinely once a month and again during outbreaks of diarrhea. Samples were taken from 17 places in the classroom and toilet areas. On the following page, Figure 1 provides a graphic illustration of the frequency of fecal contamination of surfaces during routine sampling, as well as during outbreaks.

An interesting, but not really surprising, finding is that the toilet and toilet area were not heavily contaminated. By far the majority of diarrheas occur in children less than 2 years of age (Ekanem found this true in 91% of the day care children in his study). These children are in diapers and so do not use the toilet. In addition, in contrast to the rest of the center, the washrooms were cleaned every day. Investigators also observed that the teacher who changed the diapers contaminated the diaper change pad as well as her hands and that the diaper-changing areas were rarely disinfected. In the two centers that had the most diarrhea, the teachers who cared for these young children participated also in serving food. A very important point to keep in mind is Ekanem and colleagues' finding that the hands of children and staff were frequently contaminated with fecal material. The fecal material came either from handling children or from touching contaminated surfaces. The fact is that the hands of children and staff are often contaminated. Frequent and careful handwashing by both children and staff is absolutely essential in the operation of any facility providing out-of-home care for children.

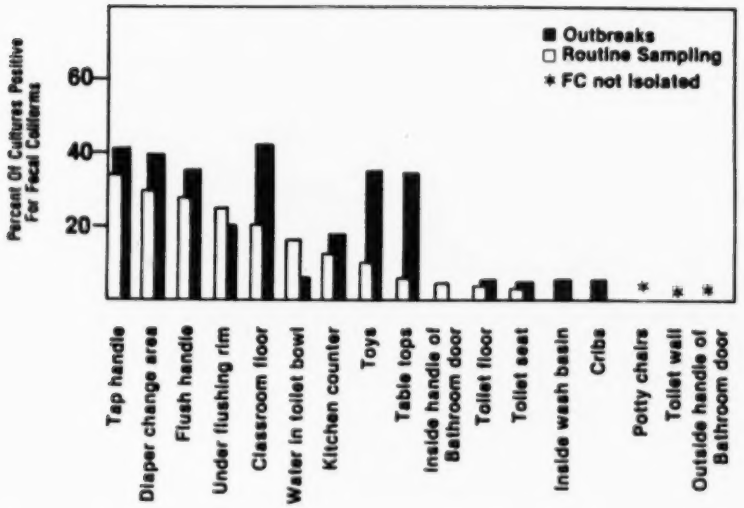

Figure 1. Frequency of isolation of fecal coliforms (FC) from surfaces (all day care centers combined). During outbreaks (shaded bars), fecal coliforms were recovered with significantly greater frequency from toys and other classroom-associated objects than during non-outbreak periods (unshaded bars). There was no significant change in the recovery rate in the toilet areas during the two periods.

From "Transmission Dynamics of Enteric Bacteria in Day-care," by E.E. Ekanem, H.L. DuPont, L.K. Pickering, B.J. Selwyn, and C.M. Hawkins, 1983, American Journal of Epidemiology, 118, pp. 562-572. Reprinted by permission.

Lemp and colleagues (Lemp, Woodward, Pickering, Sullivan, & DuPont, 1984) also found good evidence that staff members played a role in the transmission of diarrhea in day care centers. They discovered that day care centers in which staff members diapered children as well as prepared meals and served food had well over three times as much diarrhea as centers in which these duties were not combined. The acceptance of children under 2 years of age in itself was a powerful determinant of the incidence of diarrhea. Such centers had three and a half times as much diarrhea as centers that did not accept such young children.

Hepatitis A

Of all the illnesses spread by the fecal-oral route in day care facilities, hepatitis A is distinctive in that its major impact occurs in the community as a whole rather than in the child care center. Day care centers have, in fact, been conclusively demonstrated to be reservoirs of this virus. As has been mentioned briefly, hepatitis A is very often subclinical in young children, who, although without symptoms, will shed the virus in the feces. As a consequence, the disease may spread to parents and older children. The day care child may very well--in fact, most likely--acquire this nonmanifest illness from another day care child who is also without symptoms. The outbreak in the center is revealed when two or more adults with hepatitis A are shown to have children in the same center.

It is important to note that this discussion is not about all hepatitis but about hepatitis A as distinct, and it is very distinct, from hepatitis B. The clinical manifestations of the two illnesses when present are remarkably similar, yet they are different diseases. Both are caused by viruses--but not the same virus. The hepatitis A virus belongs

to a group called "enteroviruses," which cause a variety of illnesses with direct gastrointestinal symptoms and others, like poliomyelitis, that usually have no intestinal effects. All the enteroviruses are shed in the feces and spread by fecal-oral contamination. The virus of hepatitis B is not shed in the feces and therefore is not spread by eating contaminated food. A relatively rare infection in children, hepatitis B is spread by blood transfusions, infected needles, and sexual contact. A certain percentage of the afflicted become chronic carriers and are capable of spreading the infection for years or a lifetime. This does not happen with hepatitis A. There is an effective vaccine approved by the Food and Drug Administration against hepatitis B, and there is progress in developing a vaccine for A (Lemon, 1985).

Hepatitis A has an unusually long incubation period, or time between the invasion by the bacteria and manifestation of the illness. The incubation period ranges from 15 to 48 days, with roughly 30 days being most common. The virus is shed in the feces for as long as 2 weeks before there are any symptoms of the illness. The disease is usually transmitted directly from person to person by fecal contamination, but it also may be spread by fecal contamination of water or food. (This is the form of hepatitis that is known to be spread by the eating of raw shellfish caught in contaminated waters.)

In young children, who often have the disease without symptoms, diagnosis can be accurately made by laboratory tests. When symptoms do occur in children or adults, the onset may be gradual, with first the feeling of what doctors call "general malaise," which means just feeling rotten in a vague, difficult-to-describe way. There is likely to be loss of appetite, abdominal pain, low-grade fever, and suddenly, very dark

urine followed in 1 or more days by jaundice. Very rarely, the patient may go on to liver failure and death, but in the vast majority of cases there is complete recovery without therapy. This is fortunate indeed because, as with almost all viral diseases, antibiotics are not effective; neither is chemotherapy available for the treatment of hepatitis A.

In 1973, the work of Gehlbach et al. provided early evidence that day care centers could be the origin of adult cases of hepatitis A, even when the presence of the infection was not apparent in the center. Further evidence that this situation was far from rare was amply demonstrated by Storch, McFarland, Kelso, Heilmann, and Caraway (1979), who reported 11 outbreaks of hepatitis that occurred between September 1976 and March 1978 and that were associated with Louisiana day care centers. A total of 168 cases of hepatitis were considered before investigation to be simply sporadic cases--that is, not connected to one another or having a common source of infection. A public health nurse routinely carried out an epidemiological investigation to trace the origin of each case. Reporting of previous outbreaks alerted the epidemiologists to the possible involvement of day care centers, so information on all such center connections was pursued.

Defining an "outbreak" as the occurrence of viral hepatitis in three or more households associated with the same day care center within a 3-month period, investigators found that 13% of the 168 cases were day care associated and that 85% of those clinically affected were older, usually adult, contacts of children attending the day care center. Those most frequently affected were the parents in the household, particularly those who had 1- to 2-year-old children in day care.

Seven percent of the clinically manifest cases were in day care workers; 8% were in the day care children. However, a much larger number than the 8% had laboratory evidence of infection. For example, 75 children in one center were tested for hepatitis A antibodies. Although 19, or 25%, were found to have such antibodies, none of the 19 had manifested clinical illness. Clinical hepatitis occurred in the households of three of the children who were antibody positive but without symptoms. Storch et al. (1979) sum up the "lesson" of this outbreak cogently:

> What is striking about the outbreaks of hepatitis associated with day care centers described in the literature and in this study is that the major victims of the outbreaks are not the children attending the centers, but rather their adult contacts. The virus spreads almost silently among the children in the center and becomes evident only when it reaches adults in the home, causing symptomatic hepatitis often with substantial morbidity and economic cost. At this point, its association with the day care center is often not appreciated, particularly if the child serving as the index case in the household has a characteristically mild and unrecognized infection. The affected adults are then erroneously considered sporadic cases of viral hepatitis. . . .One of the most important aspects of outbreaks of hepatitis in day care centers is how easily the outbreaks can be overlooked. We began to discover outbreaks frequently only when our hepatitis surveillance was modified to include careful questioning of each person with reported non B hepatitis regarding a possible association with day care centers. (p. 1517)

Many similar studies have since appeared in the medical literature. Benenson and colleagues (1980) studied 116 clinical cases of hepatitis over a 9-month period and found that 64 of the cases were linked to a large child care facility. Another outbreak in a single center in Texas was studied in detail by Rosenblum et al. (1980). In this situation, the first adult affected was the director of the center. In a 14-week period, clinical hepatitis appeared in 3 children, 1 other employee of the center, and 13 household contacts (2 siblings and 11 parents).

An important aspect of the Texas outbreak is that, when the outbreak was fully recognized as a serious one, the decision was made to keep the center open, but no new admissions were allowed until the outbreak had clearly ended. This decision was almost certainly based on the fact that there was clear-cut evidence from previous research (Storch et al., 1979) that children who transferred from a center where hepatitis had been present apparently went on to infect their new center. This case provides a good example of the danger that must be kept in mind when the decision is made to close a center because of an infectious disease outbreak or when very strict center rules result in frequent exclusions. Many mothers simply cannot stay home from work and, not having another solution to their problem, will enroll their child in another center, thus increasing the spread of infection.

In a study of the characteristics of a center at high risk for outbreaks of hepatitis A, the age of the enrollees stands out as the most important risk factor (Hadler, Erben, Francis, Webster, & Maynard, 1982). Thirty percent of the licensed centers in Maricopa County, Arizona, studied over a 2-year period had outbreaks of hepatitis A. Outbreaks were found in 63% of centers that enrolled infants younger than 1 year of age,

32% of those enrolling children 1 year of age or older, and 2.5% of those limiting their enrollment to children 2 years of age or older. Outbreaks were also significantly more frequent in centers enrolling more than 51 children, in those open more than 15 hours a day, and in those operated for profit. These other risk factors were highly significant, but investigators noted that the spread of hepatitis was related solely to the presence of children younger than 2 years of age. In other words, the presence of non-toilet-trained children in a center was the most important determining factor in the possibility of an outbreak of hepatitis A--a consequence of the fact that the hepatitis A virus is shed in the feces.

Although many other reports of hepatitis A outbreaks have appeared in the literature, their findings are similar to those of studies already reviewed. However, one remarkable study, widely publicized in the media when it appeared in January 1983, is a genuine addition to our knowledge of hepatitis in day care (Hadler et al., 1983). During the 12 months preceding the reported study, Maricopa County, Arizona, reported epidemic hepatitis A, with the number of cases being reported 10 times the national average. That hepatitis A was widespread in the day care centers in the area had already been demonstrated by previous research (Hadler et al., 1980). During a 10-month period, there were 1,008 reported cases of hepatitis A. A total of 398, or 40%, were in people closely associated with day care centers. Outbreaks of hepatitis were found in 30 of the 308 centers in the county.

The epidemic was of such serious proportions that effective methods of intervention needed to be explored. It has been for some time a well-known fact that when immunoglobulin (Ig) is injected into contacts of cases of hepatitis A, the infection can be prevented. All antibody

molecules in the blood are, collectively, called immunoglobulins. When pooled blood is used to obtain the product, a large group of antibodies to many diseases will be present. Hepatitis A has been sufficiently prevalent that Ig made from pooled blcod will have adequate hepatitis A antibodies to prevent the individual from developing hepatitis.

It had been the practice in Maricopa County to recommend that Ig be given by the family physician to children and employees at any day care center in which at least three families had reported hepatitis cases within a 3-month period. This policy was having no effect on the incidence of hepatitis. Therefore, in October 1979, a new policy was initiated, with the intervention being carried out by the county health department.

The health department directed activities toward identifying what was considered an outbreak: a center in which a hepatitis case occurred either in one child or employee, or in parents in two different households with children in the same center, and in whom the onset of illness occurred within a 30-day period. In all such centers, Ig was given free of charge to children and employees. Great care was taken to be sure that every child was injected. Ig was not given to household contacts of center children unless the day care child actually had hepatitis. Sanitary evaluations of the centers were also conducted, and educational programs directed toward instruction in decreasing the incidence of diseases spread by the fecal-oral route were also carried out.

During the 21 months of this trial, Ig was administered in 91 centers. The effect on the community was not immediate, due no doubt to the relatively long incubation period of the illness. Eventually, however, the effects were striking. During the first year, the number of

monthly cases of illness related to day care decreased to 55% of the previous level, and, during the last 9 months of the trial, to 15% of the pretrial level. A very important finding was that the number of cases not related to day care also dropped (to 30% of the epidemic level during the last 9 months of the study). The inevitable conclusion is that the cases related to day care were spreading the disease to others in the community who did not have a day care connection.

The effect of such use of Ig in the center itself was also striking. New cases among in-center contacts ended 2 weeks after Ig administration. This incidence is in marked contrast to that noted in the control centers (centers with outbreaks in the years before the control program was initiated), where the outbreaks continued for a significantly longer time.

The recommendations made by Hadler and his group as a result of this study are well worth quoting:

> From this study, a rational program may be proposed for Ig intervention in day care centers. The foundation of such a program would be early detection of hepatitis cases in daycare centers through active surveillance or case reporting by center directors. . . .In centers enrolling infants or toddlers in diapers, identification of a case. . .should be followed by Ig administration to all children and employees at the center. If the outbreak is well developed by the time that intervention is considered (i.e., at least three families with cases, or two families with cases if both have diapered children), then Ig administration to household contacts of children aged 3 years and younger should be considered. If hepatitis A cases occur at a center not having diapered children, Ig need only be

administered to age group contacts of the index case at the center, since hepatitis A rarely spreads into large outbreaks at these centers. (p. 53)

Shigellosis

This discussion of the gastrointestinal diseases proven to be important in day care will inevitably take on a repetitive quality because of the similarity in mode of spread of all the illnesses to be described. However, each illness has important distinctive qualities, and those who work in the day care setting need to be highly conscious of the possibility of fecal contamination. Sensitivity to this problem and proper precautions are the most important practical ways now known to diminish these disease problems.

Shigellosis is a diarrheal illness in which, needless to say, feces of infected humans are the source. The organism causing this intestinal infection is the bacterium shigella, which is susceptible to antibiotic treatment. As is the case with essentially all such illnesses, the symptoms may be mild or severe and may vary from loose stools for a few days without fever or any feeling of general malaise to a severe diarrhea with fever, cramps, vomiting, and abdominal tenderness. In the latter case, there can be dehydration, a situation that can have serious consequences for children.

Children in centers are infected by contact with another infected person (there are no animal reservoirs). Occasionally, the disease is transmitted by contaminated food or water. Inanimate objects (i.e., fomites) may possibly be involved. Although the organism does not survive long outside of humans, remarkably few germs are required to be infective; consequently, the disease is highly contagious. Shigellosis is another of

the many infectious diseases that may be present without symptoms and so can be spread by children who do not seem to be sick. However, in contrast to hepatitis A, in which the usual situation is that the infected child capable of spreading the illness has no symptoms, in shigellosis the child is very often obviously sick. In the early report by Gehlbach et al. (1973), 80 to 110 infected children enrolled in a day nursery had diarrhea, vomiting, and fever.

Shortly after Gehlbach, Weissmann et al. (1974) reported that children who attended day care centers were, to a significant extent, the source of community outbreaks of shigellosis--that is, they brought it home. In the case of shigellosis, however, in contrast to hepatitis A, household contacts younger than 10 years of age were much more likely to become infected than those older than 10. Shigellosis is primarily (but not exclusively) a disease of children. An important finding of Weissman's group is that over 10% of family contacts who had no evidence of illness had stool cultures positive for the organism. In addition, the clinical cases continued to excrete shigella in their stools for an average of 12.8 days after they appeared to have recovered. In the case of shigellosis, antibiotic treatment shortens the illness and the period following the illness when the individual may be asymptomatically shedding bacteria in the stools. Antibiotics do not, of course, solve the problem of the asymptomatic child, but there is evidence that individuals with clinical illness are more likely to spread infection than are those who are infected but asymptomatic (Child Day Care Infectious Disease Study Group, 1984). The specific control method recommended in shigellosis is that, when shigella is identified in the stools, the individual is kept from contact with other children, treated with antibiotics, and not

allowed to return to the center until he or she has had three consecutive negative cultures 24 hours apart (American Academy of Pediatrics, 1982).

The recommended treatment and the control measures for shigellosis are widely known and widely used. But it would be a mistake to assume that the disease can so easily be kept in check. The development of resistance to antibiotics by the shigella bacterium is increasing in frequency. And in a study by Tacket and Cohen (1983), which used methods that made it possible to identify specific strains of shigella, it was demonstrated that exclusion of a sick child from the center did not prevent the spread of infection to another center by the very same organism. This study provided additional information that mothers who feel they must work and have no alternative methods of care will send their child, quite justifiably excluded from one center because of illness, to another center. Such a child may very well be clinically recovered but still shedding bacteria in the stools.

Giardiasis

Although the names of this single-celled creature and the disease it causes, giardiasis, are not exactly household words, the fact is that Giardia lamblia is the most commonly identified intestinal parasite in the United States. Giardia lamblia is a protozoan--that is, a single-celled animal--which has adapted to life in the human gut. It has so called "flagella," or multiple thin "arms" that provide motility. The organism resembles trichomanas, which causes a vaginal infection well-known to many women. The organism is distributed worldwide but has been found in 3.9% of examined stools of asymptomatic individuals in the United States. In some areas, as many as 16% of the stools examined have contained this parasite.

Giardia lamblia goes through two stages during its life cycle. First, a cyst is ingested (often in bits of feces, of course), passes through the stomach, and reaches the intestine. There the cyst develops into a "trophozoite," the active, feeding, and reproducing form. It maintains itself by absorbing food from the intestinal contents and seems to attach itself to the wall of the gut but does not harm the gut wall. Eventually, cysts are formed from the many trophozoites, which have multiplied in the intestine. These cysts are excreted in the stools and are the form capable of transmitting the infection. The cysts have the capacity to survive in the environment for months.

Water from contaminated sources has been a common cause of outbreaks of giardiasis. Untreated mountain streams are often posted with warnings to hikers not to drink the water because of the possibility of infection--the infection referred to is giardiasis. The source of infection in these isolated streams may be humans, dogs, beavers, and perhaps other animals.

These organisms have been found so frequently in individuals without symptoms that they were once thought to be a harmless associate of humans. However, it is now well-established that in some the organism does cause illness, although why some develop symptoms and others do not is not understood. A relatively persistent diarrhea is the most common symptom, and there is often cramping, anorexia, and associated weight loss. Again, the illness may range from mild to severe.

Giardiasis is now being recognized as an infection that is much more prevalent in children who attend day care centers than in those in home care. As with other conditions spread by the fecal-oral route, the disease is often brought home by children with resultant infection of parents and siblings.

Black, Dykes, Sinclair, and Wells (1977), studying outbreaks of diarrhea in three centers, found Giardia in the stools of 29%, 39%, and 54% of the children, respectively. In age-matched children not attending day care, the prevalence was 2%. In another study of three centers in a rural county, Sealy and Schuman (1983) found Giardia in 17%, 26%, and 32% of the respective populations. Acute or recurrent diarrhea was reported for less than 5% of the children in these centers, but none of the children with diarrhea had evidence of Giardia lamblia infection. In an oral presentation, L.K. Pickering (1984) reported two surveys for Giardia. In one, stools were collected from every child in 29 centers; 21% of the children were positive. The survey was repeated in 6 months, and 26% were positive--a persistent situation indeed. Almost all the children found to excrete the organism were without symptoms.

The prevalence of giardiasis, not surprisingly, is most common in infants and toddlers, who so busily put their hands and other sorts of equipment into their mouths. However, giardiasis does occur in people of all ages. An interesting point is that children and staff who are infected but who do not have symptoms may be more important in the spread than those with symptoms because the cysts are less common in watery stools than in formed or partially formed stools (Child Day Care Infectious Disease Study Group, 1984). Because the cysts are known to have the capacity for surviving for long periods outside the body (a fact not yet studied specifically in day care centers), environmental contamination could be an important source of infection.

Giardiasis can be cleared up in 85 to 95% of symptomatic children in one course of treatment. However, to quote the Child Day Care Infectious Disease Study Group (1984):

> Management in infected but asymptomatic children is controversial. From a public health point of view, treatment seems reasonable because such individuals are a potential source of infection for others. However, data from two states, where intensive efforts have been made to identify, treat, and in some instances exclude all asymptomatic infected children and staff, indicate that the undertaking is difficult and its effect uncertain. (p. 689)

Such measures have not been compared with other strategies in a controlled manner; therefore, the immediate and long term impact of treatment in asymptomatic children on transmission has not been determined. Because of these considerations, treatment in asymptomatic persons infected with Giardia cannot be unreservedly recommended. Resolution of this controversy will require more study. (Fortunately, health care providers will not have to make this decision.)

There are many other unanswered questions about giardiasis in day care. How does the Giardia organism get there? What is the most common mode of transmission? What is the rate of transmission to family members? How long do cysts survive on center surfaces and toys? How susceptible are the cysts to the usually recommended sanitation methods? No one has yet demonstrated by a good prospective study the effect on the incidence of giardiasis of exclusion of infected children--both symptomatic and asymptomatic--from centers.

Rotavirus Infection

The disease caused by the rotavirus is more appropriately called a gastroenteritis (inflammation of the stomach as well as intestine) than a diarrhea because it is so frequently associated with vomiting. This

infection is a serious menace in Third World countries, where it is a major cause of diarrhea, vomiting, and, not unusually, death in young children. The fact that it is most common in children under 2 and associated with a rapidly developing dehydration appears to account for its lethal potential in countries with poor sanitation and limited medical care and facilities. However, rotavirus is far from rare in the developed countries. The fact that it is a viral infection and, therefore, not susceptible to treatment by antibiotics increases the difficulties in administering effective therapy. The viral origin also increases the difficulty of precise diagnosis and epidemiological studies. Despite these difficulties, there has accumulated a considerable body of knowledge about the condition. We now know, for example, that about 50% of pediatric patients who are sick enough to be hospitalized for diarrhea have rotavirus infections (Kapikian & Yolken, 1985).

Although the exact mode of transmission has not been determined, it is generally considered that the infection is spread by the fecal-oral route. The seasonal distribution of this infection in the northern hemisphere is characteristically in cold months of the year, peaking in January and February. Occurrence decreases sharply after age 2 and appears to be unusual in children after they reach the age of 5. Rotavirus infections can be serious in any country in which they occur due to the fact that the afflicted children are so prone to become dehydrated.

About 25% of all cases of diarrhea in children between 6 months and 2 years of age appear to be due to rotavirus. This suggests that diarrheas in which a causative agent is not found by routine examination of the stool may be due to rotavirus. Whether or not the virus is actually present in the stools can be demonstrated by special immunological

techniques used on stools or rectal swabs. Commercially prepared kits usable by clinical laboratories are available for this purpose.

Subclinical cases are common, thereby promoting the spread of rotavirus diarrhea even if children who have clinical cases are excluded from the center. Most children over the age of 3 have antibodies against rotavirus in their blood, indicating a previous infection by the organism (Benenson, 1985).

Rotavirus, shigella, and Giardia lamblia are the most common organisms found in outbreaks of diarrhea in day care centers (Glode et al., 1986). This is felt to be due to the fact that not many organisms need to be ingested to cause illness. The only treatment available for rotavirus consists of rehydrating the child and giving general supportive therapy until recovery occurs. There is some evidence that rotaviruses are not effectively disinfected with the chlorine solutions recommended for sanitizing environmental surfaces in day care (Kapikian & Yolken, 1985).

INFECTIONS OF THE SKIN

Only a small number of the various afflictions of the skin are contagious. Distinguishing among these skin infections is sometimes difficult even for the physician. One should be careful, therefore, not to jump to conclusions about a skin lesion and act inappropriately. For example, many noncontagious conditions, such as certain kinds of eczema, can look like ringworm.

The major skin infections will be briefly discussed, but this discussion alone will make no one a diagnostician (although many who work with young children will already be quite expert at recognizing impetigo). Should a possibly contagious skin lesion appear, it is clearly a wise policy to suggest to the parents that they provide the center with a diagnosis from a doctor. At that time, any necessary decisions can be made on an informed basis.

Impetigo

Impetigo is a skin infection caused by a bacterium whose name is a household word--that is, "strep," or group A beta hemolytic streptococcus. Yes, this is the same organism that causes sore throats. And, yes, it does occasionally cause, if not treated, a remote complication, although the remote complication is not rheumatic fever but kidney inflammation (sometimes caused as well by strep sore throat). Sometimes staphylococcus bacteria are also found in the sores, but these are generally considered to be secondary invaders after the skin has been damaged by the streptococcus.

Impetigo is said usually to be acquired from others and therefore should be most prevalent when children are gathered into groups. However, it is also said to be most prevalent in summer. Preschool children are particularly susceptible, and the infection usually, but not always, occurs in the uncovered areas of the body. Impetigo rarely if ever occurs in adults. It affects only the very superficial layers of the skin, and the predilection for children is probably a result of differences in skin structure. Because of its superficial nature, it rarely, if ever, leaves scars after healing.

The lesion is first a red spot that rapidly becomes a blister surrounded by a zone of red. The blister quickly breaks, and a thick honey-colored crust develops. Impetigo lesions may be quite difficult to distinguish from cold sores, but the location and mode of spread are usually the best clues. Cold sores are most often (but, of course, not always) confined to the lip area. Impetigo may be close to the lips and is frequently right under the nose, but it may begin any place on the face or other parts of the body. A characteristic feature is that satellite lesions develop as the condition goes untreated, and the satellites appear at some distance from the original lesion with intact skin between.

Impetigo is effectively treated with antibiotic ointments that can be purchased over the counter. Bacitracin or neosporin or neosporin-bacitracin ointments combined are all effective. A severe case is most appropriately treated by giving oral antibiotics. Some physicians always prefer oral treatment to avoid any chance of complications. The child is probably noncontagious the day after such systemic treatment is begun. Although there are no established rules for treatment with ointments, it seems logical to allow the child to return to school as soon as the sores

appear to be drying up (which can happen quickly) with the teacher's continuing to apply ointment until the healing is well along.

Fungus Infections

There are several kinds of fungi capable of infecting the superficial layers of the skin of humans. In fact, they involve only the outside layer of skin--the so-called keratin layer. Nails and hair are modified forms of keratin; therefore, these are also susceptible to invasions by fungi. There is an age predilection for various sites of invasion. Postpubertal individuals rarely have fungal infections of the hair and scalp; prepubertal children rarely have infection of the nails, palms, and feet. All ages get fungus infections of the body, with the exception of a fungus infection of the groin, tinea cruris ("jock itch"), which is common in adults only.

Ringworm of the Scalp

The characteristic findings of ringworm of the scalp are roundish areas of hair loss with broken hairs visible in the scalp. The latter is an important point to consider to avoid confusing a scarred area with ringworm. Hair does not grow in scar tissue, and occasionally one sees bald spots due to such scarring. In another noncontagious condition that children sometimes have, called alopecia areata, there is patchy loss of hair, but in the areas of hair loss the scalp is very smooth, without stubble or inflammation.

Ringworm of the scalp is transmitted by personal contact, and it can be acquired (as can other fungus infections) from dogs, cats, and farm animals. However, an infected animal will show signs of the condition. An animal that doesn't show such signs will not spread the infection. (This point is emphasized because pets are sometimes excluded from schools, with their potential for transmitting ringworm as the excuse.)

Ringworm of the scalp is an indolent condition that may last for years if not treated. It is seldom self-limiting until the age of puberty, when spontaneous healing does take place. However, the child of 4 cannot wait until puberty. Before the antibiotic era, heroic measures had to be taken, such as complete shaving of the head or even hair removal, sometimes by radiation. However, there is now effective antibiotic treatment.

Some of the fungi that cause ringworm of the scalp glow under an ultraviolet light, and in the days when this was quite a common condition in the public schools the public health nurse would go through whole classes examining scalps in a darkened room. This was done in any class in which one case had been diagnosed. Even when the hair does not glow, the diagnosis can now be made by simple laboratory tests in the physician's office. Since a prescription medication is needed for effective treatment, referral to the doctor in a suspected case is mandatory. Once antibiotic treatment is instituted, the child need not be isolated. However, the wearing of protective caps to prevent spread of the infection by broken hair and scales is still recommended (American Academy of Pediatrics, 1982). This is a badge of dishonor, so it is fortunate that the infection is currently in abeyance.

Ringworm of the Body

One form of ringworm of the body first appears as a red bump that enlarges to form a circular red area with the center clear and a sharply defined border that often has tiny red blisters. It is this type of lesion that has given the name "ringworm" to fungus infections of the skin, but it is by no means the most common appearance of fungus infection (Allen & Rippon, 1985). Fungus infection often takes the form of large

"plagues," without central healing, but there is considerable scaling, sometimes quite thick, and, again, the borders are sharply defined. The lesions are sometimes slightly itchy and may look very much like eczema, which is the result of an allergic reaction and not at all contagious. Allen and Rippon point out that ringworm infections mimic a wide variety of other dermatoses, and that a diagnosis of ringworm infection of the skin made on the basis of a ring-shaped lesion will be more often erroneous than correct. They also point out that ringworm of the body is only "feebly" contagious. Nevertheless, since the infection is feared as a contagious condition, it is best to have a medical diagnosis. Again, these fungus infections can be accurately diagnosed by a simple laboratory test any dermatologist can do in the office.

Fungus infections of the skin can be adequately treated by the application of ointments that can be purchased over-the-counter. Once treatment is being applied, contagion need not be feared.

Scabies

Scabies is an infection of the skin by a tiny insect. The female actually burrows into the skin, where eggs are laid. The eggs turn into larvae, which leave the burrow, develop into adults, and start the cycle over.

When examined superficially, scabies lesions are rather nondescript small red spots, although in children there is a tendency to form small blisters. In adults, the spots are most common on the hands and wrists, elbows, feet and ankles, and genitalia. In children, the face and soles of the feet are often involved. The hallmark of the infestation is extremely severe itching, reaching the intolerable level when the child is in bed under warm blankets. A physician's examination is required for an

accurate diagnosis of scabies; the infection is effectively treated by the same medications as are used for lice.

Although it sometimes happens that a day care child has scabies, repeated investigations by epidemiologists have shown conclusively that this infection is unlikely to be transmitted in schools. The more intimate contact of the home environment is more likely to produce multiple cases (Juranek & Schultz, 1977).

Cold Sores (Herpes Labialis)

A few years ago, no one would have troubled to include material on cold sores in a discussion such as this. For most of the lifetimes of mature people, cold sores were viewed simply as part of everyday life. Everybody seemed to get them once in a while, favorite (and useless) home remedies were applied, and the episode was treated by the patient as a minor nuisance and ignored by others.

That has changed. Cold sores have suddenly become HERPES and are consequently viewed by many with fear and horror. But herpes infections in humans are ubiquitous. About 75% of middle class Americans show antibody evidence of infection with herpes by ages 41 to 45, and the percentage is considerably higher in the lower socioeconomic classes. The acquisition of herpes simplex antibodies occurs throughout life and certainly occurs in some during the preschool period (Rawls & Campione-Piccardo, 1980).

Most are familiar with the appearance of cold sores--blistery looking sores on the border between the lip and skin that quickly break and ooze a yellowish material that crusts and then heals. These sores can, at times, be legitimately confused with impetigo. Cold sores are always a recurrence; they are not the primary infection. In the vast majority of

cases, the first infection of herpes labialis ("herpes of the lip") is inapparent. A small percentage of children have a symptomatic first infection; when that occurs, the infection may be severe although self-limiting. The primary lesion is called herpetic gingivostomatitis (inflammation of gums and mouth). All the membranes of the mouth and tongue may be covered with oozing sores, gums are red and swollen, the lymph glands of the neck are enlarged, and there may be a high fever. (The reader should understand by now that there will be a gamut of severity from mild to severe--the worst case is described here). The child may be very sick. The present author once saw a 10-year-old girl with this condition who was having too much pain to swallow her saliva. She had to be hospitalized for nutritional support.

One of the great problems in the control of herpetic infections is that the virus is often present when there are no sores. This is common in the intensively studied herpes 2 virus (or genital herpes) but is also true of the cold sore variety (Wright, 1982). In fact, the condition is felt by many authorities to be spread mainly when people are not showing lesions, although the virus is present in much greater abundance when sores are present.

In the presence of this kind of an infection in a member of the staff, repeated handwashing by the individual with the lesions and care to avoid close personal contact should be adequate for control. However, this is an example of one of those infections, as will be discussed later, that require special measures for good public relations if for no other reason. Because of the currently prevalent attitude that herpes is a loathsome, life-destroying disease, it is probably best that employees with identifiable cold sores be asked to stay home.

OTHER ILLNESSES OF SPECIAL SIGNIFICANCE IN DAY CARE

Many infectious diseases are of importance to all young children whether or not they are at home (especially those with siblings in school), day care, or grade school. Four additional conditions are considered to present special risks to children enrolled in day care: cytomegalovirus (CMV) infection, chicken pox, head lice, and pinworms. A fifth, Acquired Immune Deficiency Syndrome (or AIDS), is a rarity in the day care setting but has received sufficient media attention to warrant discussion.

Cytomegalovirus (CMV) Infection

Cytomegalovirus (CMV) infection, like HiB, is of considerable importance but is unfamiliar to most who are not medical professionals. CMV belongs to that group of viruses now erroneously considered a desperate menace, particularly by many young people: the herpes viruses. Four of this group can cause human illnesses:

1. Herpes simplex, which consists of two forms: labial herpes (or herpes 1) and genital herpes (or herpes 2). These forms are so similar they are classified as one organism.
2. Chicken pox, or varicella, which can at times take an alternate form, herpes zoster (shingles). These two conditions are caused by the same virus.
3. Epstein-Barr virus, which causes infectious mononucleosis.
4. Our topic of the moment, CMV.

All of these viruses have the capacity to exist in the host in latent form and reactivate occasionally, frequently, or not at all. There is some immunity stimulated by the infection, but this immunity does not protect against recurrences. The reactivated form is usually somewhat different from the primary infection, often less severe, and sometimes very different (e.g., chicken pox and shingles are caused by the identical virus).

CMV has been found to be remarkably widespread in human populations. It is of special importance in day care because close contact seems to be necessary for its transmission, and we are realizing more and more that the closeness of contact in day care centers resembles that experienced in the home environment.

In undeveloped countries with crowded conditions, CMV is ubiquitous (the same situation is the case for herpes simplex viruses). Although in developed countries the level of infection is greatest among the poor, approximately half of the adults in any population have evidence of infection with CMV, as indicated by the presence of specific antibodies.

Those infected are known to shed the virus from saliva, urine, breast milk, semen, and the uterine cervix. CMV is present in the blood as well. It appears not to be highly contagious and seems to require close personal contact for transmission. Therefore, household contacts and those in situations that reflect the intimacy of household contacts are most at risk for acquiring the infection (Osborn, 1982).

Despite the widespread nature of the infection, CMV is virtually unknown at present to the public because the vast majority of those who are infected have no evidence whatsoever of illness. This makes

prevention virtually impossible. Even when the illness is manifest, diagnosis cannot be made clinically; it must be made by laboratory tests: culturing the virus or looking for antibodies in the blood.

Accumulated evidence indicates that children in day care centers have much higher rates of infection with CMV than children in home care. Many studies are now being reported, but that by Pass, August, Dworsky, and Reynolds (1982) is typical. This group studied a single day care setting caring for 75 children of suburban families of middle to upper income: well-educated, many professional. Seventy of the 75 children were examined for virus excretion from saliva and urine. The lowest rate was observed in infants under 1 year of age. In this group, only 9% were shedding virus. The highest rate (83%) was in toddlers in the second year. Fifty-nine percent of all the children in the center older than 1 year were excreting virus. As they became older, some had apparently stopped shedding virus, but antibodies (evidence of an earlier infection) would probably have been found in the blood of some of the children not excreting virus. The low rate for infants is probably due to their relatively immobile state, whereas toddlers are able to get around vigorously and are still in the "mouthing" stage.

The rate of CMV found by Pass and his colleagues (1982) is much greater than that observed for children of the same age in this country as a whole. In fact, as Pass points out, the rate found in this middle class day care center was similar to that found in developing countries. By studying antibody levels in the mothers of infected children, investigators concluded that the children acquired the infection in the center rather than at home. Pass and his group also cultured toys for the presence of virus and found that four plastic toys that had been mouthed

by children who were known to excrete virus in the saliva were positive when the culture was taken immediately after the toy had been removed from the child's mouth. How long the virus would live on such a surface is unknown.

If the disease is almost always asymptomatic, as it is, why are we concerned about its high incidence in day care centers? Again, let us quote the Child Day Care Infectious Disease Study Group (1984):

> Primary CMV infection in pregnant women is followed by symptomatic congenital disease in 5% to 10% of their newborn children. When one realizes that the virus may be shed in urine or saliva by infected children for up to 4 years such children can represent a potential risk to their still child-bearing mothers or young women who work in the centers. (p. 896)

However, alarming as all this certainly sounds and may be, it should be kept clearly in mind that no one has yet proven that women of child-bearing age who have young infected children of their own or who work in centers are at any greater risk than other women. Even when a mother has a primary infection during pregnancy, 90% to 95% of the infants born to such mothers are intact. Those that are affected show nervous system abnormalities: various degrees of mental retardation from mild to severe; inadequate brain development resulting in microcephaly (a very small head) associated with mental handicaps; and other forms of neurological deficits such as hearing loss due to nerve damage and, occasionally, cerebral palsy. Studies of antibody levels of people who work with congenitally infected children and of nurses who work with infants and children in hospitals have not shown an increase in CMV antibody levels over that for control groups who do not have such exposure. This was also true in a

study done in Birmingham, Alabama, where it was found that the antibody level in those who worked with children in day care was similar to the rate for women of the same age in the community (Child Day Care Infectious Disease Study Group, 1984).

The risk of a child's being infected with CMV in day care and then infecting a pregnant mother or day care worker is a worrisome possibility, but it is not a proven chain of events at the present time. Good sources of more detailed information about CMV in general, as well as other infectious diseases, are two books available in medical libraries: Infections in Children, by Wedgwood et al. (1982), and Principles and Practice of Infectious Diseases, by Mandell, Douglass, and Bennett (1985).

Chicken Pox

Chicken pox, or varicella, is the only one of the standard fever-rash diseases for which there is no vaccine being recommended at present. Protection against diptheria, whooping cough, and tetanus have been available for a very long time. Within relatively recent memory, parents could check off measles, German measles, and mumps with a sigh of relief as their children recovered. Now there is only chicken pox to get through, and most parents should have no doubt their children will get it. Again, the case may be mild to severe, and, in fact, some adults who have no history of the illness can be demonstrated to be immune. Day care workers, having almost certainly had chicken pox as children, can count on not being susceptible. (As in all aspects of medicine, this is not 100% true. Rarely, there are those who, although raised in densely populated areas, mysteriously escape very common and very contagious illnesses. To their great distress and despite assurances from their doctors that they are immune, they sometimes get an illness when their children bring it

home from day care or school. Such illnesses are apt to be more severe in adults than in children.)

There is no evidence that day care attendance puts children at special risk with respect to chicken pox. One study showed that 27% of the cases of chicken pox appeared in preschool children (Wenner, 1982). However, as those who work in centers are bound to see this illness, some discussion of the condition is in order.

Chicken pox is one of the most contagious of illnesses, spread from person to person by drops from the respiratory tract. As has been mentioned, it is one of the herpes viruses and may reappear in modified form in the same individual as a disease called shingles, otherwise known as herpes zoster. The incubation period for chicken pox is about 2 weeks. The child is contagious from 2 days before the rash appears to 7 days after the first crop of blisters can be seen. Since new crops of pox may appear, a child sometimes has many blemishes 7 days after the appearance of the first sign of the rash. However, the child is not contagious and may return to school. It is considered mandatory to isolate the child for 7 days from the appearance of the rash, although the necessity of exclusion from school has been questioned by some.

Symptoms before the rash are often very mild or nonexistent. When the rash does appear, it is so characteristic that it should not be difficult for lay people to learn to recognize it without difficulty. First, there is a red spot that becomes elevated and then develops into the characteristic blister, sometimes, but not always, with a red area around it. The blister has a rather clear, pearly appearance, which is very distinctive. The rash usually appears first on the scalp, face, or trunk. As the blister dries, a crust forms that falls off in anywhere

from 5 to 20 days. The lesions usually appear in crops over a period of 3 to 5 days and, as a result, produce one of the most characteristic features of chicken pox--lesions are present in all stages of development in one area at one time. That is, one can see red bumps, blisters, and crusts all in close proximity. The number of pox may vary from a few to hundreds.

A natural question about chicken pox is, because chicken pox and shingles are caused by the same virus, can shingles spread chicken pox? The answer is emphatically yes, although the communicability for shingles is less than for chicken pox. An instructive case has been recently reported (Riegle & Cooperstock, 1985). A 3-year-old boy who had had chicken pox at the age of 4 months developed shingles. He continued to attend nursery school with a physician's advice to keep the lesions covered. Unfortunately, he seemed to feel his lesions provided status, and he repeatedly lifted his shirt both to scratch and to exhibit his interesting blisters to his classmates. Twelve days later, the first chicken pox experienced in that center for 6 months appeared. There were 40 susceptible children in the entire school, and 20 of those developed chicken pox, some from the child with shingles and others from the children who caught chicken pox from the child with shingles. The exclusion rule recommended for shingles is therefore the same as for chicken pox.

It is interesting that an effective vaccine to prevent chicken pox is available and has been for a considerable time. It was developed in Japan, where it appears to be in wide use. In this country, the vaccine is not available for general use. There are enthusiastic advocates of including the vaccine in the regular immunization regime and others who

oppose it. The advocates feel the disease occasionally presents sufficient risk to warrant general immunization, whereas others argue that the disease is too mild to justify even the minor risk an immunization program might engender. In addition, there is some discomfort about injecting a live (although weakened) herpes virus into a child. There have been as yet no reported problems in Japan, and the vaccine has proven protective in children with defective immune systems. The present author, an advocate of only necessary interventions, is in favor of leaving things the way they are (with respect to chicken pox, that is).

Head Lice

In a survey of all schoolchildren in three states, the CDC found that an average of 8% of children in kindergarten through eighth grade had head lice (Juranek & Schultz, 1977). Incidence ranged from 3 to 20%; cases were exceedingly rare in black children (0.3%). There is no count on the frequency of head lice in day care, but personal experience tells us all the condition is not rare.

There are no serious consequences whatsoever caused by infestation with the head louse, and infestation is an easily treatable condition. Nevertheless, some view it with sufficient distaste and, occasionally, alarm that it is desirable to avoid an outbreak in a day care center.

The distaste seems to stem from the fact that the presence of head lice in a child is thought to indicate that the child is not well cared for or that the home is dirty. This belief results in eagerness to blame others for the condition, so the school is usually blamed. And, indeed, head lice are spread wherever children are in close contact, whether it be home or school. Although infestation is more common in low income communities, 10% of the cases were found in middle or upper income areas.

It is a contagious infestation; anyone can get it. However, because of the stigma attached, outbreaks should be stemmed with more vigor than is required by the seriousness of the condition itself.

Head lice survive by sucking blood from the scalp (but not in quantities that anyone will miss). Itching is not always present, but, when it is, it is probably due to an allergic reaction to the parasite's saliva (Duncan, 1982). The female lays 50 to 100 eggs in its life span of about 3 weeks. The eggs (called nits) are firmly attached to the hair and hatch in under 2 weeks. Lice, if removed from the head into the surrounding environment, do not do well. They may survive for up to 3 days at the most. However, three days seems to be time enough to give some lucky lice a chance to attach to another warm body. Lice are transmitted from one person to another by physical contact or through objects such as combs, hats, or bedding.

As mentioned, some complain of itching of the scalp, and the resultant scratching can cause lesions that may become secondarily infected. However, in most cases there are no symptoms, and the condition is picked up because a parent, teacher, or nurse notices the nits attached to the hair. The nits are the major diagnostic clue. It is rare that the lice themselves will be visible. There may not be a great many, and they can manage to scurry from sight underneath the thick scalp hair.

The nits have a very characteristic appearance even to the naked eye (although a magnifying glass helps). They are easiest seen just above and around the ears, usually close to the scalp. These tiny, whitish, oval-shaped bodies firmly attach to one side of the hair and--a very important clue--they will not shake off, as will dandruff. In fact, they cannot even be moved along the shaft of the hair. They are stuck right where they are.

Some overzealous (and no doubt needlessly anxious) people have been known to diagnose dandruff as nits. The differentiation is so easy there is really no excuse for this error. Very rarely, some children have on their hair objects called keratin casts, which are more excusably mistaken for nits. However, the casts encircle the entire hair shaft, they are not on one side only, and they can be slipped up and down the shaft of the hair, whereas the nit cannot be moved. A medical degree is not necessary to diagnose head lice. Seeing one example and having the features pointed out is sufficient. However, in case of doubt, there are, in many communities, public health nurses whose help can be solicited.

Treatment for head lice is quick and effective. There are several prescription formulations whose brand names are well known: Kwell and Gamene among them. Another effective preparation, available over-the-counter, is called Rid. There is no agreement as to whether or not these preparations kill the nits, so some recommend a second application a week later to kill the lice from any eggs that may hatch after treatment.

Special treatment is needed for bedclothes and wearing clothes. Instructions are, or should be, included with the medication. Combing out every nit with the fine comb provided with the medication can result in effective treatment in exactly 1 day. That is, a child could be sent home one day and come back the next, after proper treatment, in a cleansed and noncontagious state.

Some scorn the idea that a treated child who has visible nits is still contagious (Fine, 1983). However, since this opinion is controversial, the center could legitimately demand that there be no visible nits before readmission. If the parents are informed of this rule, they may be spurred on to vigorous and complete treatment.

Pinworms

Although certainly not the only worm infestation that occurs in children in the United States, pinworms are by far the most common and the most likely to be part of the day care experience. Pinworms have been called one of our oldest and most constant companions. Their eggs have been found in fecal remains from caves, and the oldest of this fossil excrement has been radiocarbon dated to almost 8,000 years B.C. The continuing success of the parasite may be due at least partially to its simple life cycle, which does not require a host other than humans. The worm also has other certain characteristics helpful in bringing about its survival: It is eminently fit for what it is trying to do.

Although a great variety of symptoms have been attributed to pinworms --anorexia, nose-picking, and stomachache, to name a very few--these organisms cause only one symptom, and that one--anal itching--is nicely calculated to bring about the preservation of the species. The eggs are laid by the adult female just outside the anus. They stick to the skin rather than falling off, and they cause itching, sometimes a lot. Naturally, the child scratches and picks up the eggs on fingers and under fingernails. Shortly afterwards, the child is almost certain to put hands in mouth, and the cycle is perpetuated. The eggs are usually transmitted from hand to mouth, but they can survive for a short while on bedclothes, room dust, and pet fur. Therefore, these are also possible sources of transmission.

The eggs are swallowed, hatch in the small intestine, and migrate to the large intestine. When the female is mature and carrying eggs and when the host is asleep, she will migrate outside the anus, where she deposits as many as 11,000 eggs and then dies. The eggs cause itching, the child

scratches, and the cycle starts over. The complete cycle lasts from 4 to 6 weeks.

The only clue to the presence of the infestation is usually itching around the anus. Two methods of diagnosis are mentioned, but only one is of much value. It is said that, if one examines the anal region of a child at night, one can sometimes see the active worms. The better method is to touch the anal region with the sticky side of Scotch tape as soon as the child wakes from sleep. The tape can then be put on a slide and examined through a microscope. One swabbing is said to detect 50% of infections; three swabs, 90% (Duncan, 1982).

There is effective treatment, all by prescription drugs. It is recommended that, if one member of a family is infected, all other members of the household be treated without search for the eggs. Laundering of bedclothes and wearing clothes should be carried out at the same time.

If a day care child is known to have worms and has been treated, it doesn't seem particularly useful to inform the parents of uninfected children. If the children have no symptoms, they are very unlikely to reinfect themselves or to pass the infection to others. If they do have symptoms, the parents (well, some parents at least) are likely to seek treatment on their own. Each situation will have to be dealt with on the basis of the nature of the clientele and the inclinations of the day care operators. Pinworms are not a hazard to the public health.

Acquired Immune Deficiency Syndrome (AIDS)

Although Acquired Immune Deficiency Syndrome (AIDS) is included under the heading of illnesses of special significance in day care, it would be difficult, at the present time, to support the contention that this disease is of special significance. The number of AIDS cases of day care age is exceedingly small, and those cases are confined mainly to a

few big cities, with most in New York. Nevertheless, it is possible that the AIDS virus and the manifestation of the AIDS syndrome may become somewhat more frequent in infants and toddlers in the future, and there is such intense interest and concern about the condition, particularly with respect to its communicability in ordinary settings, that some discussion seems worthwhile.

Any discussion of AIDS is necessarily complicated by growth of knowledge about the condition and the intensity of research presently being conducted. What is true today may not be true in another year, at least with respect to prevention and/or treatment. The mode of spread and the importance of casual contact in the spread have, however, been determined. At least in Western countries, careful study since the identification of the illness has shown stability in the mode of spread as well as in the incidence of the illness in the various groups at risk.

Those at risk are homosexual and bisexual men, intravenous drug users, individuals who received blood transfusions between 1980 and 1984, hemophiliacs, the sexual partners of the above groups (especially of homosexual and bisexual men), and infants born to women in these listed groups. There is also some evidence to suggest that the virus is present to a greater degree in the general population in Haiti; as a consequence, Haitian individuals are considered at higher risk.

High risk stems from exposure to blood and semen. Well over 70% of all cases of AIDS are related to homosexual sex, apparently because the virus is present in the semen and because anal sex, in which at least a small amount of bleeding is apt to occur, is very common in homosexual sex. Sexual transmission of the disease is not entirely confined to homosexuals or bisexuals. However, in the United States, where meticulous epidemiology is possible, documented cases of heterosexual transmission

are low. When such transmission does occur, it is usually from a man to a woman. Of the identified 180 cases in which heterosexual transmission is a possibility, 152 were passed from a man to a woman. It is more difficult to document transmission from a woman to a man; at present, there are considered to be possibly 28 such cases (Sande, 1986).

Intravenous drug abusers are infected by contaminated blood from shared needles. The sharing of needles is encouraged by the fact that syringes are not legally obtainable without a prescription from a physician. (This law appears to be about to be modified, at least in some states.)

Those who have acquired AIDS from blood transfusions clearly were given infected blood. The use of infected blood in transfusions should now be exceedingly rare or nonexistent with the new precautionary testing of donors for the presence of antibodies against the AIDS virus. Similarly, hemophiliacs are at high risk because they must take intravenously a product made from blood pooled from many donors. New methods of processing this product, now in use, appear to make it safe.

According to the CDC ("Education and Foster Care," 1985), the majority of infected children acquire the virus from their infected mothers in the perinatal period. Children may also become infected through transfusion of blood or blood products that contain the virus. Of the pediatric cases reported to the CDC, 70% occurred among children whose parent had AIDS or was a member of a group at increased risk of acquiring the infection; 20% occurred among children who had received blood or blood products; and, for 10%, investigations are incomplete.

Confidence that AIDS is transmitted exclusively as described above continues to be reinforced by new research findings. It has now been demonstrated conclusively that, even when there is close contact

characteristic of family living, the disease is spread only to some sexual partners. Day-to-day close but nonsexual contact among family members of all ages and family members with AIDS or with high-risk individuals with AIDS virus in their blood has not resulted in AIDS or even a positive antibody test in other family members, even over prolonged periods (Friedland et al., 1986; Jason et al., 1986). (A positive antibody test is evidence of exposure to, but not presence of, the AIDS virus.)

Sande (1986) feels the infrequent spread of AIDS even in the "secretion-rich" home environment may be partially explained by the fact that, although the AIDS virus has been found in saliva, this is an extremely rare event (Ho et al., 1985). In 83 homosexual men whose blood was antibody positive for AIDS, 56% of blood specimens, but only 0.5% of the saliva cultures, yielded virus. In the 1 case in 50 in which the AIDS virus was found in saliva, there was a small yield of virus--much less than was present in the blood.

Additional powerful support for the claim that AIDS is spread only in this very limited manner is the fact that, of close to 2,000 health care workers with intense and consistent exposure to patients with AIDS for up to 4 years, only 0.1% have been shown to have antibodies to AIDS in their blood. There is only one documented case of a nurse, who sustained an accidental stick with a needle contaminated with blood from an AIDS patient, who actually became infected. (Needle sticks in nurses are not uncommon.)

In the face of the impressive accumulated evidence, it must be concluded that infection by casual contact does not occur and, as Sande (1986), addressing the medical profession, has remarked,

> We need to support public and medical officials who oppose universal screening, quarantine, the exclusion of students from classrooms, and the removal of employees, including health care workers, from the work place. The evidence presented by Friedland et al. is a powerful argument with which to counter the public's fear of casual contagion and should be used to thwart attempts to discriminate against persons in the so-called high risk groups. (p. 381)

Indeed, the accumulation of scientific evidence should encourage all of us to support the public and medical officials who are bravely struggling to stem the hysteria that is having an adverse effect on many lives, including those of helpless young children.

However, whether or not an individual day care operator chooses to courageously join the fray and admit an AIDS-infected child to his or her own center will have to depend on a variety of factors: the inclination of the operator, the attitude of the staff, and the nature of the clientele. It is easy to make recommendations; it may be difficult to implement them. Fortunately, very few center operators will have to face this dilemma. As of August 20, 1985, only 183 of the 12,599 reported cases of AIDS in the United States were among children under 18 years of age ("Education and Foster Care," 1985). This number is expected to double in the next year (although the rate of increase in high-prevalence communities is now slower than had been predicted).

The CDC, in consultation with individuals appointed by their organizations to represent them, have prepared a battery of recommendations on the education of infected children. These organizations include associations of public health officers and school principals and the National Congress of Parents and Teachers, among

others. Of special interest to individuals involved in day care are this group's findings, quoted directly from Morbidity and Mortality Weekly Report ("Education and Foster Care," 1985):

> Confidentiality issues. The diagnosis of AIDS or associated illnesses evokes much fear from others in contact with the patient and may evoke suspicion of life styles that may not be acceptable to some persons. Parents of HTLV-III/LAV[AIDS]-infected children should be aware of the potential for social isolation should the child's condition become known to others in the care or educational setting. School, day-care, and social service personnel and others involved in educating and caring for these children should be sensitive to the need for confidentiality and the right to privacy in these cases. (p. 518)
>
> Risk of transmission in the school, day-care or foster-care setting. None of the identified cases of HTLV-III/LAV infection in the United States are known to have been transmitted in the school, day-care, or foster-care setting or through other casual person-to-person contact. Other than the sexual partners of HTLV-III/LAV-infected patients and infants born to infected mothers, none of the family members of the over 12,000 AIDS patients reported to CDC have been reported to have AIDS. Six studies of family members of patients with HTLV-III/LAV infection have failed to demonstrate HTLV-III/LAV transmission to adults who were not sexual contacts of the infected patients or to older children who were not likely at risk from perinatal transmission.

Based on current evidence, casual person-to-person contact as would occur among schoolchildren appears to pose no risk. However, studies of the risk of transmission through contact between younger children and neurologically handicapped children who lack control of their body secretions are very limited. Based on experience with other communicable diseases, a theoretical potential for transmission would be greatest among these children. It should be emphasized that any theoretical transmission would most likely involve exposure of open skin lesions or mucous membranes to blood and possibly other body fluids of an infected person. (pp. 518-519)

Risks to the child with HTLV-III/LAV infection. HTLV-III/LAV infection may result in immunodeficiency. Such children may have a greater risk of encountering infectious agents in a school or day-care setting than at home. Foster homes with multiple children may also increase the risk. In addition, younger children and neurologically handicapped children who may display behaviors such as mouthing of toys would be expected to be at greater risk for acquiring infections. Immunodepressed children are also at greater risk of suffering severe complications from such infections as chickenpox, cytomegalovirus, tuberculosis, herpes simplex, and measles. Assessment of the risk to the immunodepressed child is best made by the child's physician who is aware of the child's immune status. The risk of acquiring some infections, such as chickenpox, may be reduced by prompt use of specific immune globulin following a known exposure. (p. 519)

RECOMMENDATIONS

1. Decisions regarding the type of educational and care setting for HTLV-III/LAV-infected children should be based on the behavior, neurologic development, and physical condition of the child and the expected type of interaction with others in that setting. These decisions are best made using the team approach including the child's physician, public health personnel, the child's parent or guardian, and personnel associated with the proposed care or educational setting. In each case, risks and benefits to both the infected child and to others in the setting should be weighed.

2. For most infected school-aged children, the benefits of an unrestricted setting would outweigh the risks of their acquiring potentially harmful infections in the setting and the apparent nonexistent risk of transmission of HTLV-III/LAV. These children should be allowed to attend school and after-school day-care and to be placed in a foster home in an unrestricted setting.

3. For the infected preschool-aged child and for some neurologically handicapped children who lack control of their body secretions or who display behavior, such as biting, and those children who have uncoverable, oozing lesions, a more restricted environment is advisable until more is known about transmission in these settings. Children infected with HTLV-III/LAV should be cared for and educated in settings that minimize exposure of other children to blood or body fluids. (p. 519)

IMMUNIZATION

Very little needs to be said about any of the diseases preventable by immunization because there is an excellent chance they will not present a problem (and should not in any center that takes only children over the age of 2).

Effective immunization is one of the greatest achievements of modern civilization. It prevents diseases that in the past have been serious, widespread, and frequent killers. Immunization was the basic tool in the stunning accomplishment of eliminating all smallpox, a disfiguring and killing disease that had been a scourge since the beginning of recorded time. Despite these facts, many parents, alas, have demonstrated an unwillingness to bother to have their children immunized. They neglect immunization not out of principle (this happens, but rarely) but for some unfathomable reason--indifference, ignorance, preoccupation with other things?

This unwillingness has been amply demonstrated by the fact that, until the beginning of the 1980s, immunization levels were considered a national disgrace. Every year during immunization month (September), the levels of immunization would be published with many expressions of sorrow and failure. These figures tended to run (varying from one disease to another to some extent) just a little over 60%.

In the late 1970s and early 1980s, in a program orchestrated by the CDC, the schools began to enforce the immunization laws strictly. No

child was allowed to enter any grade until immunization was complete and properly documented. Parents may not bother to have their children immunized, but they are highly motivated to make any arrangement that will allow the child to be admitted to public school. In a few short years, immunization levels in school-age children rose above 90%. These levels were considered so satisfactory that the CDC were predicting the eradication of measles (a somewhat hasty prediction, it now appears). Unfortunately, this improved level of protection is not true for preschool children.

What day care operators need to keep in mind is not only that they should encourage immunization for the sake of the child and the community but that, in most states, parents have a legal obligation to have their children so protected. A file of each child's immunization should be carefully kept and updated as immunization is completed. A recall system should be instituted so that staff members can make appropriate inquiries and give appropriate encouragement when it is time for the next injection. Day care personnel should be so thoroughly familiar with the vaccines and the recommended schedules that they need not look them up when a child's record is checked. A brief summary of these recommendations is provided in Table 1, on the following page.

The child who follows the recommended schedule will have completed, by about 18 months, all that is needed until entrance to kindergarten. Centers that confine enrollment to children 2 years old and older should therefore see none of the illnesses for which immunizations are available.

Diptheria/Whooping Cough/Tetanus Immunization

The most controversial of the vaccines appears to be, at present, the pertussis or whooping cough component of the combined diptheria/whooping

TABLE 1

RECOMMENDED IMMUNIZATION SCHEDULE

Combined diptheria/whooping cough/tetanus (DPT)

Original series: Three injections at least 6 weeks apart, but can be at a longer interval. Earliest age for starting is 6 weeks, but can be later. Whooping cough protection not included after 6 years.

Boosters: First booster 1 year after the last of the series described above. Second booster at the time of entrance to kindergarten or 3 years after the first booster. Additional boosters once every 10 years throughout life.

Poliomyelitis

Original series: Vaccine taken orally two times at least 6 weeks apart (can be longer). Earliest age for starting is 6 weeks (can be later).

Boosters: First booster a minimum of 1 year after the last of the series of two. Second booster at the time of entrance to school or 3 years after the first booster. No further boosters needed.

Combined measles/German measles/mumps (MMR)

Original vaccination: One injection no earlier than 15 months.

Booster: None needed.

Hemophilius influenzae type B disease (HiB) vaccine

Original vaccination: For children in day care, at 18 months with a repeat vaccine 18 months later is recommended by the CDC but is controversial. For all children at age 2.

Booster: Not needed if original vaccine given at age 2 or later.

NOTE: For discussion of HiB disease vaccination, see section I, on respiratory diseases.

cough/tetanus immunization (DPT). Since this topic may come up for discussion when day care personnel are dutifully reminding parents of the need to complete immunizations, some information on the topic should be worthwhile.

During the 1930s, whooping cough, or pertussis, affected about 265,000 people each year and was the cause of death in 9,000 to 12,000 (Fulginiti, 1984). The median incidence of whooping cough for the years 1979 through 1983 was 1,636--an impressive drop from 265,000. The decrease is generally attributed to the vaccine that came into widespread use in the 1950s and 1960s.

Those at highest risk for death are in the first year of life; the younger the child, the more dangerous the illness. In fact, it is because of the urgency of protecting against whooping cough in the early months that DPT is started at 6 to 8 weeks. The whooping cough rate is still as high as it is because the whooping cough vaccine is not as protective as some of the others (for example, polio vaccine). However, the fact that it does give considerable protection can hardly be denied in the face of the numbers given above.

It is also felt that the troublesome but minor side effects (temporary high fever, evidence of pain, localized swelling and redness) that may occur in the 24 hours after a DPT injection are due mainly to the pertussis fraction. Because it is not known exactly what part of the whooping cough organism causes the immune response, the entire bacterium is included in the vaccine and is probably the cause of such reactions.

However, parents seemed content to vaccinate their babies against whooping cough--a severe, long-lasting, and debilitating disease--until Dr. Gordon T. Stewart of Glasgow, Scotland announced in 1974 that the

vaccine was not protective and that it also caused permanent brain damage in one in 25,000 children innoculated. Although, according to Edsall (1978), Professor Stewart's views were regarded as unacceptable by virtually every qualified epidemiologist in Britain, the response to the announcement was, understandably, an almost immediate drop in the use of pertussis vaccine. Immunization levels in England dropped from 77% in 1974 to 30% in 1978. In 1977-79, there was a major pertussis epidemic, with 102,000 reported cases. The high incidence continues. In the first 9 months of 1982, there were 47,508 cases reported. Immunizations improved somewhat after a select committee of English experts, concluding that the risk from pertussis vaccine was both slight and outweighed by its advantages, strongly recommended its continued use. However, acceptance levels are still substantially lower than they were in 1974 ("Pertussis," 1982).

A study from Japan is even more impressive. As reported by Fulginiti (1984), two children died in Japan from complications of pertussis vaccine, and the vaccine was withdrawn from use; in succeeding years, more than 35,000 children contracted the disease, and 118 died.

The CDC estimate that there may be about 1 case of brain damage in 130,000 immunizations with pertussis vaccine. This is clearly a "worst case" conclusion, but the figure is not really reassuring to parents. Parents should keep in mind not only that whooping cough is a miserable experience to witness in one's own or another child but that children, especially in the early months, do die from the disease. The 1 in 130,000 ratio is surprisingly high: Very few practitioners ever experience an episode of brain damage after DPT injection, even those who administer hundreds of thousands, as is the case in health departments. Bader (1978)

supervised the administration of 450,000 doses of pertussis vaccine while a member of a large health department, reporting that there was only one serious neurological complication after pertussis vaccine given by the department, and it was very doubtful if that case was related to the vaccine.

For every medical intervention, no matter how minor, there always seems to be some price to be paid. A genuine effort on the part of the medical community is made to be sure that before an intervention is recommended the benefits outweigh the risk. Although the pertussis vaccine does indeed have risks, it is generally considered that the benefits outweigh the risks by so much that pertussis vaccine for all young children is strongly recommended. There is, in the meantime, active research to develop an improved pertussis vaccine, and early evidence of excellent progress has been reported.

Safety of Immunization

How safe are immunizations, generally? In late 1978, the CDC established the Monitoring System for Adverse Events Following Immunization ("Adverse Events," 1985). Establishing that an adverse event after immunization was caused by a particular vaccine requires careful weighing of clinical, laboratory, and epidemiological evidence. The fact that a child becomes ill after an injection does not by any means necessarily prove that the injection caused the illness. For example, a child may have been incubating a case of meningitis before the immunization was given. A cause and effect association is greatly strengthened by a determination that the rate of a given illness following immunization is significantly higher than the rate of that illness in the absence of vaccination.

On the whole, the rate of adverse effects that lead parents to seek medical care is remarkably low. For example, over the 4-year span from 1979 through 1982, there were a total of 16 cases of encephalitis (brain infection) or encephalopathy (brain abnormalities) following immunization. No evidence of a causal relationship between sudden infant death syndrome (SIDS) and DPT injections (the only injection given when SIDS is most prevalent) has been demonstrated. Children who had convulsions following DTP vaccination were significantly more likely to have had convulsions previously than persons who had other adverse events following DTP vaccination. The risk of convulsions following DTP vaccination was 8.1 times higher for persons with histories of convulsions than for persons without such histories.

Despite our current well-immunized state and because children younger than 15 months (when measles/German measles/mumps vaccine is given) sometimes get these diseases, because even older children are sometimes not perfectly immunized, and because no vaccine can be counted on to be 100% effective, those in contact with young children are still somewhat at risk. Therefore, <u>all</u> day care staff should themselves be completely up-to-date in their immunizations.

<u>Vaccination for Measles (Rubeola) and German Measles (Rubella)</u>

For a variety of reasons, certainty of immunity to measles (rubeola) and German measles (rubella) in adults can be difficult, and the rules for each of these diseases are different (see Table 2, on the following page). Those born before 1957 can consider themselves immune to measles. Because the disease is so extremely contagious, before a vaccine was available essentially all were exposed, got the disease, and were subsequently immune for life. Those born after 1957 who were vaccinated

TABLE 2

VACCINATIONS FOR MEASLES (RUBEOLA) AND GERMAN MEASLES (RUBELLA)

Do you need measles (rubeola) vaccine?

The answer is NO if one of the following conditions is true:

1. You were born before 1957.
2. You have a reliable history of having had the disease.
3. You were immunized against measles in 1967 or later.

The answer is YES only if none of these three is true.

Do you need German measles (rubella) vaccine?

The answer is YES if

1. You have never been immunized against rubella.

before 1967 should have been reimmunized because the vaccine used during that period was only partially effective or was incorrectly given. Those vaccinated in 1967 or later, or who have laboratory evidence of having had measles (determined by the antibody level in blood) or a solid history of having had the disease, can be considered immune. Because the disease is often so severe that a doctor is likely to be called in, and because it has some characteristic features, a history of the disease is considered reliable evidence of immunity.

However, German measles, or rubella, can be a mild and fleeting disease easily mistaken for other conditions causing a mild fever and rash. Therefore, the history of having had rubella is not sufficiently reliable to be considered evidence of immunity. In addition, an appreciable number managed to get through childhood before the vaccine was available without having the disease and consequent immunity to it. The rules for administration of vaccine are very different for rubella than for measles. Certainty of immunity to rubella is achieved only if there is documentation of immunization or rubella antibodies present in the blood, as determined by a laboratory test. In the absence of a vaccination against rubella, it is now considered the simplest and best policy simply to be immunized without bothering with an antibody test.

Young women who may become pregnant fear vaccination because of possible danger to the developing fetus. Although this is certainly a justifiable concern, and a woman of childbearing age should delay pregnancy for 3 months after immunization with rubella vaccine, the facts are that meticulous follow-up by the CDC of women vaccinated during pregnancy indicates that the currently used vaccine has not caused defects compatible with congenital rubella syndrome when inadvertently given to pregnant women ("Rubella Vaccination," 1982).

Although the decrease in the dreaded congenital rubella syndrome since introduction of the vaccine has been gratifying, congenital rubella syndrome still occurs. The number of cases is small (only 4 were reported in 1984), but this low incidence is due to the persistence and determination of many segments of the community in achieving and maintaining good immunization levels. There is no reason to believe the good record will continue without continuing effort on the part of many people, including those who care for young children outside their homes.

Sensible guidelines that are truly helpful in preventing the spread of communicable diseases, which are relatively easy to follow and will not unnecessarily disrupt the operation of a center or the lives of parents, are difficult, perhaps impossible, to devise.

Some of these difficulties have already been made clear: For one, the center may be well-seeded with germs by a child before he or she manifests an illness. And then, of course, there are the children who are sick without symptoms, but who themselves develop immunity to the disease and spread it to others (hepatitis A is the classic example). For most communicable illnesses, there is considerable doubt if any diminution in spread can be achieved by excluding symptomatic children (Lodan, Glezen, & Clyde, 1972). In addition, as was demonstrated by Storch et al. (1979), excluded children are often put in another center that has lower standards, and thereby the burden of infection in the community is increased.

Edward Zigler of Yale, who has focused on the area of social policy, has made a plea for avoiding policies aimed at decreasing infectious disease that also increase the problems of poor parents (Zigler, 1984). Since legitimate uncertainty exists about the benefits of many exclusion policies as now practiced, this plea has considerable merit.

The guidelines arena has certainly been confused and confusing. For example, most states have licensing agencies that have formulated

regulations aimed at management of infectious illness. Are these rules similar from state to state? Hardly. To repeat Shapiro's (1984) findings: 56% of the states have directed that children with any communicable disease should be sent home, 32% have left the management of ill children to the discretion of the individual center, and 12% have no specific regulations. Since formulation of such rules is taken seriously and involves much expert opinion, the variation from state to state makes clear the uncertainty that has pervaded the rule-making field.

And how well are the state rules followed when they are made? Using data from a questionnaire, Shapiro (1984) found marked variation in the practices of different centers in a Connecticut city. (Connecticut is one of the states that requires exclusion of all ill children.) As Shapiro states,

> Despite the considerable concern about the occurrence of transmissible infections among children who attend day care centers, there is little information about how best to manage and prevent such infections [emphasis added]. This survey demonstrates substantial variation in the criteria used by day care centers to exclude ill children. Although all of the centers cited fever as a reason for exclusion, there are substantial variations both in the minimum temperature defined as fever and in the method used to ascertain a child's temperature. (p. 690)

He then goes on to point out that the absence of fever does not mean that a child's illness is not transmissible since children without fever may shed substantial quantities of a disease-producing virus.

The easiest kind of rules to make are those that simply exclude all children with communicable illness or fever, that demand that, before readmission, all children come armed with a doctor's statement, etc., etc. What is not known is how well such rules are followed (indeed, how rigorously can they be followed in the real world, where unexpected events should always be expected?) and if they would make much difference if they were followed.

One fact that might bring some comfort to the harassed day care operator is that, despite the spectacular rise in insurance rates for day care, litigation in the area of spread or acquisition of communicable disease in day care has been described in a personal communication to the present author by one lawyer who has made a study of the topic as "miniscule to nonexistent." The few lawsuits there have been against day care centers have been for the most part due to automobile accidents in those centers that provide transportation or to physical injury sustained in other ways (on a wet bathroom floor or on the playground, for example).

It is somehow presumptuous for physicians--who would inevitably have the major voice in devising guidelines but who do not experience the daily variety, complexity, and human drama of day care events--to dictate to those who make the actual decisions how they must handle every single day care problem related to infectious disease. Nevertheless, guidelines are certainly needed. There are at least a few precautions that are known to diminish the risks of infectious disease in day care, and day care directors often feel the need for such rules. Because directors are forced to make decisions in matters in which they are not well-informed, authoritative rules are helpful to them and also function as an effective way to gain compliance from parents.

For the above reasons, the recent distribution of a nontechnical but informative, specific, dramatically presented, and well-illustrated set of rules by the CDC is a welcome event. The stature of the CDC as probably the most prestigious center of communicable disease control in the world assures that these rules will be widely accepted and will almost certainly be considered the standard to be used by states in devising their infection-related rules.

In the early months of 1986, the CDC distributed copies of these guidelines, entitled What to Do to Stop Disease in Child Day Care Centers: A Kit for Child Day Care Directors, to all day care centers serving 10 or more children. The kit is generally available from the United States Government Printing Office, Superintendent of Documents, Washington, DC 20402 (GPO Stock No. 017-023-00172-8) for $4.00 a copy.

Despite the availability of the CDC training kit (which all operators of day care centers and day care homes should certainly have), the present author has still included a previously devised set of guidelines. Although these are similar to the CDC rules, they are more succinct and include a section specifically related to policies with respect to staff. These latter guidelines were devised with certain principles in mind. First of all, an attempt was made to follow the dictum of Michael Osterholm (who convened the first national symposium on infectious disease in day care) that only what is really important should be regulated (Osterholm, 1984). Next, they were based as far as possible on the results of scientific research. Since the research in many areas has not yet been done, some common sense came into play. Also, since communicable conditions are viewed with disproportionate alarm by the public, certain rules are included mainly for public relations reasons. It is difficult,

if not impossible, to change the public mind on these issues, so it is best just to go along.

Sleator's Suggested Guidelines

1. Be certain that every child in the center has the appropriate immunizations for his or her age. By 2 years of age, all children should have the full complement of immunizations against diptheria, whooping cough, tetanus, poliomyelitis, measles, German measles, and mumps. Keep track of the younger children and nudge the parents when the time comes for the next immunization.
2. Rigorously follow the practice of meticulous handwashing at various specified times throughout the day. The best arrangement is running water next to each diaper-changing locality, with the faucet operated with a knee or foot pedal. Because to have such devices available is expensive, some ingenuity may be required. It has been suggested that, to achieve running water, a large coffee urn with a spigot could be used. Running water, soap, single-use disposable towels, and at least 15 seconds of rubbing are recommended. It is also wise to use a paper towel in turning off possibly contaminated faucets and in handling other contaminated surfaces.

   Hands of children should also be washed after toileting and always before meals. Staff should always wash hands before helping the children with their eating. The adherence to strict handwashing rules is important for avoiding spread of those diseases transmitted by the fecal-oral route. The work of Black et al. (1981) has already been cited to demonstrate the efficacy of careful handwashing.

   The diseases we would hope to avoid by meticulous handwashing are all the diarrheas and hepatitis A. In addition, the same

procedures are recommended for the prevention of respiratory illnesses. There is now good evidence that colds spread by some of the many cold viruses are transmitted as much by hand contact as by environmental spray. Some of the viruses can live for at least several hours on environmental surfaces and may be picked up on the hands. Or a child, handling his or her own respiratory secretions, may spread the viruses to others through hand contact. Therefore, not only should hands be washed as described above but, additionally, they should be washed after any contact with respiratory secretions, and paper tissues with such secretions should be disposed of carefully. Such disposal should again be followed by handwashing.

So much handwashing with soap may result in "dishwasher's hands." This is unfortunate but one of the hazards of the trade that must be accepted as inevitable.

3. Maintain cleanliness of environmental surfaces. The Child Day Care Infectious Disease Study Group (1984), citing unpublished data showing that gastrointestinal disease-causing organisms can survive outside the host on environmental surfaces for prolonged periods (true also, as has just been mentioned, of respiratory disease viruses), recommends regular cleaning of such surfaces. They do not commit themselves on how often this should be done or on whether a disinfectant should be used (and, if so, what disinfectant). There is as yet no research showing that the meticulous daily washing of surfaces with sanitizing solutions cuts down the incidence of diseases spread by the fecal-oral route. How briefly an object would stay decontaminated in an infant-toddler center can readily be imagined. However, high standards of cleanliness are certainly in order and seem to be the only guideline with respect to environmental

surfaces that can be urged without qualifications at the present time.

4. When aware of a specific diagnosis (hepatitis A in a parent, sibling, or staff member; shigellosis; giardiasis; bacterial meningitis; any kind of HiB disease; or any of the standard communicable diseases such as measles or whooping cough), report the infection to the epidemiologist at the local health department. The health department may be able to provide substantial help in containing the outbreak. Health departments vary in quality from one community to another. An effort should be made to find out how yours can help you.

Osterholm (1984) recommends surveillance by health departments as a help in understanding the spread of communicable diseases and in eventually containing them. It was through surveillance that the Minnesota Department of Health (with which Osterholm is connected) found that there was rarely a second case of HiB disease in a center. This finding resulted in their recommendation that preventive chemotherapy not be instituted until a second case appears in the same center.

Other states also appear to be adopting a surveillance policy. For example, the Illinois Department of Health now requests reporting by all schools, including day care centers, of communicable disease in the school. A form to be filled out and returned weekly is distributed to each school and center.

5. In centers admitting infants and toddlers, do not allow staff who care for these young children to participate in the preparation and serving of food. Kitchen facilities should be inspected by sanitarians connected with the local health department. Minimum instructions for safe food service are listed in Table 3, on the following pages.

TABLE 3

MINIMUM INSTRUCTIONS FOR SAFE FOOD SERVICE

Personal hygiene

1. Wash hands with soap and hot water before starting work or after using toilet.
2. Do not wash hands in the sink where food is prepared.
3. Do not prepare, handle, or serve food if you have a skin infection, cold, or diarrhea.
4. Wear a clean apron.
5. Wear a hairnet or cap.
6. Keep fingernails clean.

Refrigeration

1. Keep air temperature in the refrigerator from 33-40 degrees. Keep a thermometer in the refrigerator so you can be sure the temperature is always at the safe level.
2. Allow food to be out of the refrigerator a minimum amount of time, especially after it is cooked and before serving.

Cooking

Allow temperature to reach a minimum of 140 degrees (165 degrees is recommended).

Table 3, continued

Dishes

Throw out chipped or cracked china and glasses. Use three dishwashing steps:

1. Detergent wash at 120 degrees.
2. Rinse in clear water.
3. Sanitize.

   Least expensive is liquid chlorine bleach, which comes in gallon containers in the grocery store. Use 1 ounce of bleach in 4 gallons of water (which makes the optimum 100 parts/million). Immerse dishes in this solution for 1 minute.
4. Air dry in rack. Do not dry with towels.
5. If a dishwasher is used, allow the temperature to reach 180 degrees (higher than most home dishwashers).

6. Exercise judgment in notifying parents of illness in the center. Parents need not necessarily be notified of every communicable disease that occurs: examples are colds, isolated cases of acute gastroenteritis (diarrhea and vomiting are the usual symptoms), undiagnosed sore throats, etc. Some guidelines in deciding when to notify all of the parents with children in the center follow:
   a. When exposure of their child to a contagious illness may require an intervention by the parents. An example is the presence of a case of meningitis, when their doctor may choose to give preventive antibiotics to the possibly exposed child.
   b. When knowledge that their child has been exposed will be helpful in taking precautions or making a diagnosis should their child acquire the same illness. An example would be a case of chicken pox or strep throat in the center. In the latter case, the parents would be inclined to be sure their child had a throat culture in the case of development of a sore throat.
   c. When the illness is such that the parents would be disturbed if they heard it had occurred in the center and they had not been notified. Depending on the client, pinworms and impetigo are examples of this situation.
7. Be aware that the spread of certain contagious illnesses is prevented in some cases by methods other than exclusion. The major such condition is hepatitis A, in which the administration of immunoglobulins for other attendees is often indicated and will stop an outbreak. The extent of the preventive treatment will vary depending on the situation and should be determined by the children's physicians or the local health department. It is important to

remember that the presence of hepatitis A in a center is often first determined by the presence of manifest hepatitis A in a member of the day care staff or parents or siblings of the attendee.

Similar techniques for control of spread are used for other serious illnesses such as HiB disease or meningitis. Preventive treatment will again be determined by medical professionals, but it is important that the center be kept informed by the parents when these diagnoses are made so center staff can be helpful in instituting proper preventive treatment for the other children.

8. Keep children's outside garments well-separated from each other when children are indoors.

9. Establish exclusion policies, notify parents, and request that parents abide by them. A child should not be excluded from school unless there are genuine reasons for doing so. A too-rigid exclusion policy can cause unnecessary hardship to parents and may result in spread of illness because the parents seek a less-rigid school. However, there are some situations in which exclusions are necessary. These fall into three categories: cases in which there is known possibility of spread of contagious illness by the child's continuing presence in school; cases in which the child is so ill that he or she needs the quiet and comfort of home and parental or individual care; and cases in which there may be no great danger of spread or spread is not a very serious matter, but for public relations reasons it is important that the child be excluded until treatment is instituted. Conditions for which exclusion is the safe policy include the following:

a. Diarrhea. In general, it is recommended that children with diarrhea be sent home. How many stools a day and how soft they must be to be considered diarrhea may not always be clear. Most cases of diarrhea are self-limiting, and no causative organism can be found. However, it is best, particularly if the diarrhea persists for more than a few days, to request that the parents consult a physician or local health department to try to determine the cause. This practice could prove helpful in controlling an outbreak in the center.

b. Conjunctivitis ("pink eye"). Although it is not always of contagious origin, pink eye is a legitimate cause for exclusion. Pink eye caused by a bacterial infection is frequently characterized by a thick discharge that causes the eyelashes to stick together when the child awakens in the morning. However, center staff should not try to diagnose the cause but should request that the parents consult a physician; the ointments required for treatment are prescription drugs. There are, of course, exceptions to this exclusion rule. For example, if a child has a reliable history of allergic conjunctivitis appearing at certain times of the year, it is safe not to exclude the child. (Conjunctivitis has not been previously discussed because all that the day care worker needs to know about it can be briefly discussed here. It has not been shown to be of special importance as one of the conditions spread in day care.)

c. Head lice. The child can return the next day if there is reason to believe treatment has been correctly applied.

d. Skin conditions that may be contagious. The excludable conditions are impetigo, ringworm, and scabies. A medical diagnosis is often needed; again, the staff will have to exercise some judgment. A reliable history from a parent can be very helpful. The child may return very shortly after treatment is instituted.

e. Fever. Some fevers are considered sufficient reason for exclusion. However, if fever is associated with a cold, and the child is feeling well enough to enjoy school, exclusion is certainly not mandatory. As has been pointed out, the spreading of the germs usually has taken place before fever and other symptoms develop.

f. Persistent sore throat. In the event of persistent sore throat, it is wise to request that a throat culture be done. If the culture is positive for group A beta hemolytic strep, the child should be excluded for 24 hours after treatment has begun.

g. Chicken pox. Exclusion for this disease is customary. Children can be readmitted 7 days after the appearance of the first crop of vesicles.

h. Children too sick to stay in school. For caregivers, the appearance of the child is as good a clue or better than the temperature in assessing the child's status. A sick child looks sick: lethargic, irritable, not his or her usual self. It is very important that the center know how to reach the parents or a designated alternate at all times in case it is necessary to send a child home at mid-day. The exclusion of obviously sick children will often result in elimination from

attendance of those children who are going to develop one of the serious communicable diseases previously discussed (such as meningitis) before specific symptoms develop.

A quick morning inspection and a few words with parents will give a good deal of information. Certainly, this practice will give a clue as to which parents may need to be contacted later in the day; foolproof arrangements for reaching these parents should be set up on the spot. (At one time, there were centers in which each child was greeted with a tongue depressor. Not only is that a dreadful way for the child to begin the day, but the appearance of the throat is noninformative. Many asymptomatic children have somewhat inflammed throats most of the winter.)

A splendid service the center might provide would be to suggest alternate caregivers for sick children. If achieved, such alternate care would be an expense to the parents, but it would make exclusion from school a less wrenching experience (for both the school and parents). Unfortunately, center staff the present author has talked to have had difficulty in finding people willing to care for sick children, often because of reluctance to be exposed to communicable diseases.

9. Have at least one staff member on duty who has had a standard Red Cross course in first aid. Although this guideline has nothing to do with preventing spread of infection, it is sufficiently important to mention whenever guidelines are being discussed. Accidents happen to children despite every precaution. If necessary, the center should provide the free time and pay for the training to insure that someone well-informed, and preferably experienced, in first aid is always available.

10. The rules applying to staff are similar to those that apply to children, with the addition of special duties directed at diminution of spread of communicable diseases. To summarize:

a. It is no more necessary to exclude a staff member with a cold than it is a child with a cold. In fact, the high level of staff absenteeism that would certainly result from exclusion of all staff with colds probably would be more dangerous to the child than being exposed to a teacher with a cold. It is, of course, possible for an adult to be sufficiently debilitated by a cold that attendance at work would be counterproductive. Since older children appear to be less susceptible to colds, it is sometimes recommended that teachers with severe and obvious colds be temporarily reassigned to working with older children. In addition, parents often have a strong concern about the fragility of their infants, so they might very well be alarmed at seeing a teacher who was sniffling and coughing and nose blowing taking care of their little one (unaware that the baby had very likely already been exposed by an asymptomatic child or teacher). The reassurance to parents resulting from good public relations is not a trivial aspect of day care management.

b. Teachers with diarrhea, hepatitis (which is usually manifest in the adult), chicken pox, shingles, measles, German measles, cold sores, scabies, head lice, or "pink eye" should be excluded according to the standard public health rules of the state or the rules discussed under the children's guidelines above.

c. All adults who work in day care centers should be up-to-date on immunizations. According to the American College of Physicians'

Committee on Immunization (1985), because of their unique and intense exposure to young children, all day care center personnel should be fully immune to measles, mumps, rubella, and poliomyelitis. In addition, they should be given influenza vaccine on an annual basis. Rules for determining whether or not an adult needs measles and rubella vaccination are outlined in Table 2, on page 86. Mumps and polio vaccines will also be needed for day care personnel if they have neither had the diseases nor been immunized against them. (All male adults should have the mumps vaccine according to this rule whether or not they work in a day care center.)

It is recommended that those who need to be immunized against poliomyelitis when they are older than 18 years have the inactivated polio vaccine (Salk), which is given by injection. This is advisable because it appears that the risk of paralysis associated with oral polio vaccine is slightly higher in adults than in children. Most adults living in the United States who have not had polio vaccine as children do not need it. However, vaccination does become necessary for travel to some areas of the world. The primary series for inactivated polio vaccine consists of four doses, three given 4 to 8 weeks apart and a fourth given 6 to 12 months after the third.

Because of concern for the health and safety of the fetus, it is accepted practice to avoid any drugs or procedures in pregnant women unless they are absolutely necessary. However, the killed-virus vaccines (tetanus and diptheria) appear to be safe. In fact, tetanus vaccination is at present encouraged

during pregnancy to protect the fetus during the first months of life. The live-virus vaccines--that is measles, rubella, mumps, and oral polio--should be avoided during pregnancy.

Day care workers should also have regular tuberculin tests with appropriate follow-up (that is, chest X-rays) if the tests are positive. It used to be mandatory that all teachers have such a test yearly. This rule has been modified and mandates such tests only on first employment. However, because of the intimate contact in day care and the potential seriousness of tuberculosis in very young children, it is best for day care workers to have yearly tuberculin tests. These (as well as most immunizations) are usually available without charge at the local health department.

d. Finally, as has already been discussed at length, dedicated, determined, and even compulsive handwashing is a necessity. This includes day care workers' washing their own hands as well as the children's hands. As noted earlier, teachers who work with diapered children should not prepare or serve meals.

11. Educate day care staff so that they will be well-informed about the communicable diseases prominent in day care as well as the reasonable preventive measures. This last guideline is coming into more and more prominence, at least in the statements being made at meetings devoted to the problems discussed here.

Although regulations put out by state licensing agencies abound, very few mandate staff training related to communicable disease. And good factual courses taught by medical professionals are a rarity. An exceptional situation, but one that could prove a model, is a course

required as part of the Developmental Child Care Program at the University of Illinois at Urbana-Champaign. This course on pediatrics and nutrition is dedicated to training college students to be leaders in the field of providing out-of-home care for preschool children. Taught as part of the program for 12 years by a pediatrician and a member of the nutrition faculty at the university, the course was innovative when it first was instituted. Unfortunately, despite the vast growth of our knowledge of communicable diseases in day care, the course remains as unique today as it was the day it was first taught.

Finally, as Michael Osterholm (1984) put it in a talk in St. Louis in the summer of 1984: "Regulation will not decrease infection; staff education will."

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